JUNE 1941—FORTY-SEVENTH YEAR

MACHINERY

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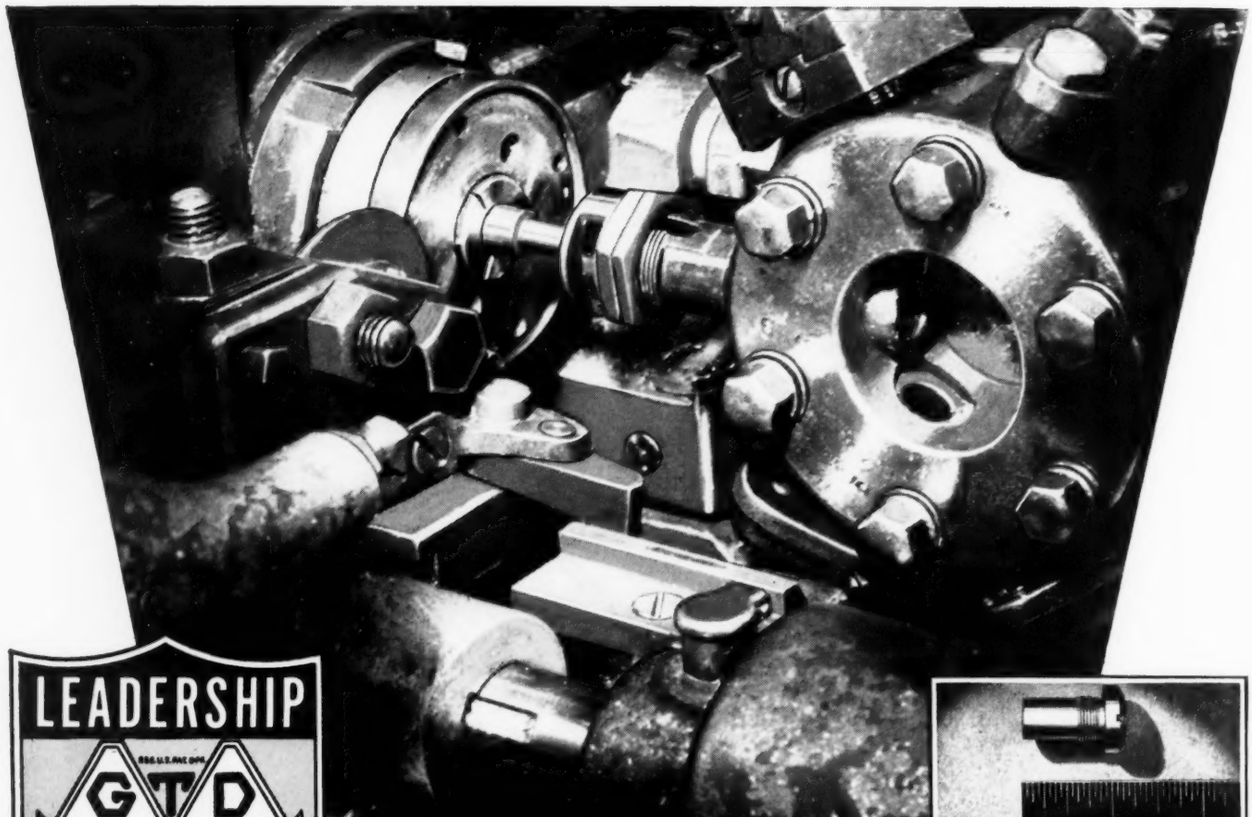

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MACHINERY

JUNE, 1941

There is no other branch of industry engaged in the manufacture of war equipment that is so prominently in the public eye as aircraft building. July MACHINERY — the Annual Aircraft Number—therefore strikes a note of especial interest to all who wish to be informed of the most recent advances in mechanical practice as exemplified by that industry. In the preparation of the articles for this number, aircraft plants from coast to coast were visited, and many phases of the manufacture of both engines and planes are covered.

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Number 10

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MACHINERY

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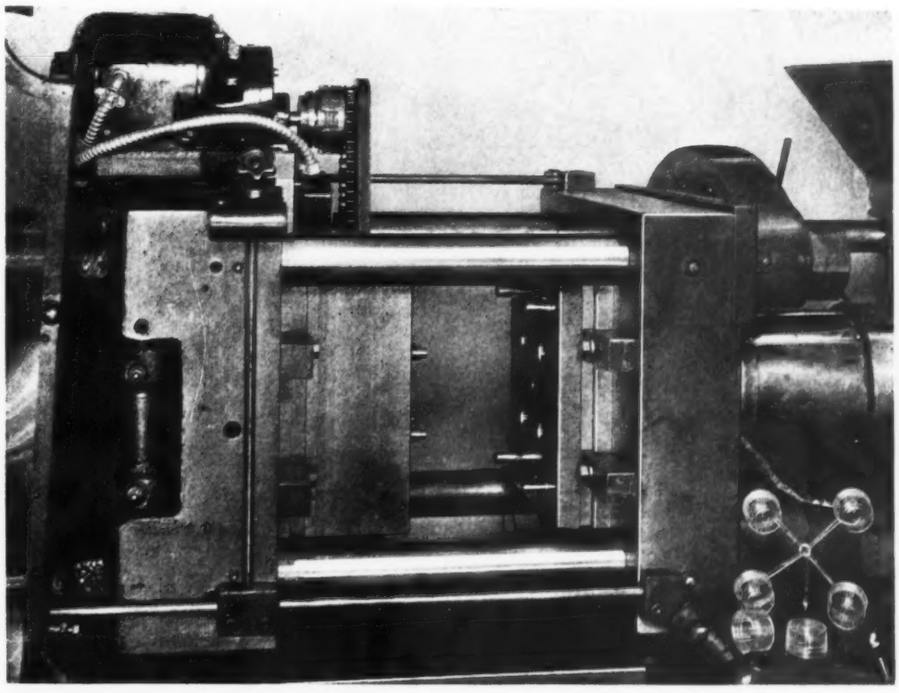
Basic Factors in Injection-Mold Design



Marked Improvements in Mold Operation May be Expected if the Points on Design Given in This Article are Taken Carefully into Account

By W. R. WHEELER
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National Carbon Co., Inc.
Cleveland, Ohio

THROUGHOUT the progress of the injection-molding industry much has been said, but little written, on the details of injection-mold design. Because of the many sources from which the developments have come, there has been a more or less inadequate exchange of basic information. This article, therefore, is planned to cover some of the factors in injection-mold design which, in the course of the writer's experience, have proved to be important. While some of the points here discussed may appear elementary to those experienced in the design and use of molds, it has been thought desirable to include them for the sake of those who are not so well acquainted with the methods involved.

The basic elements of any injection mold are briefly: (1) *Sprue*, the part in the path of the plastic's flow which connects the nozzle of the heating cylinder with the channel leading to the mold cavity—the space in which the part to be molded is formed; (2) *runner*, the channel between the

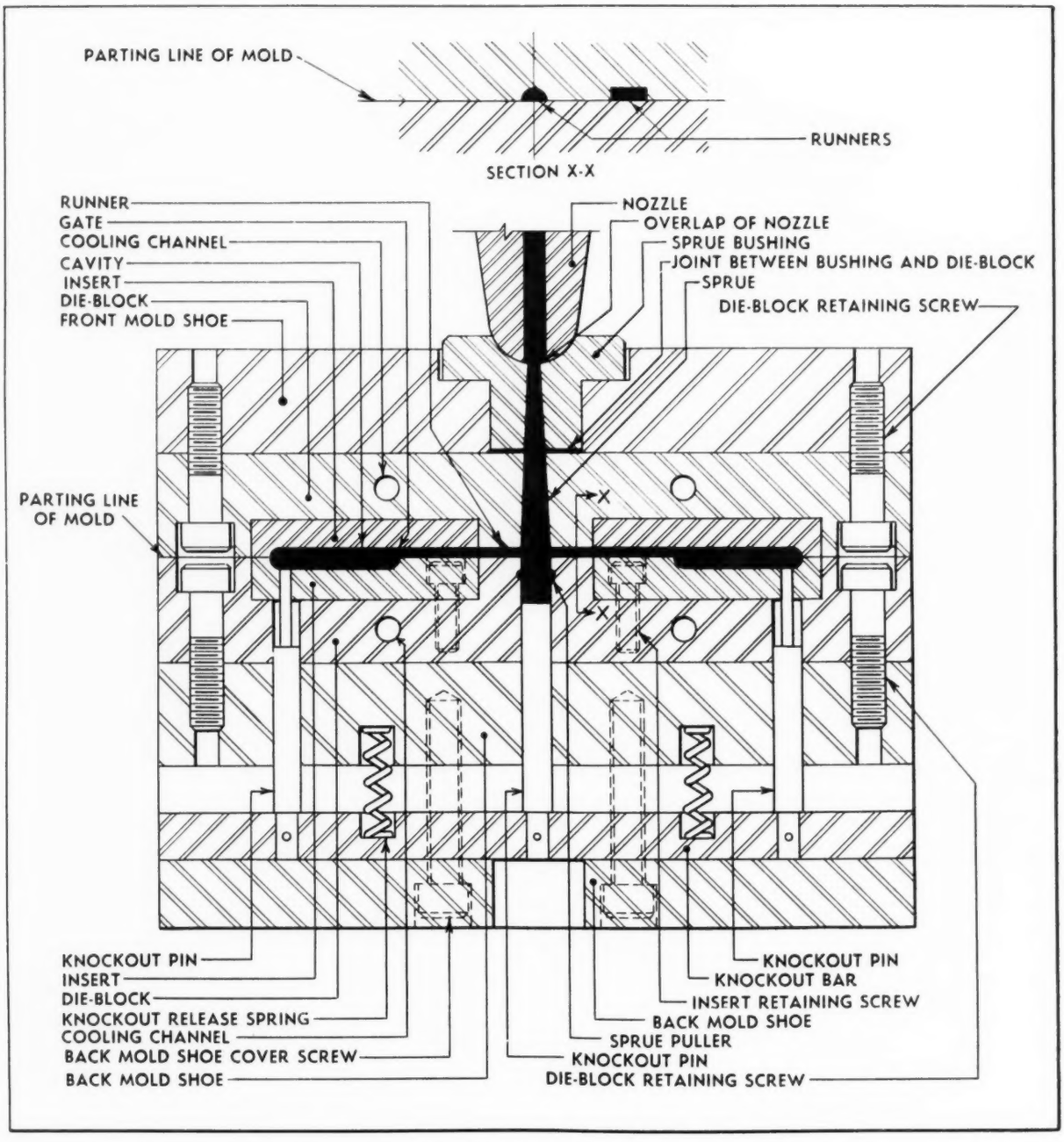


Fig. 1. Section of Injection-molding Unit Showing Some Construction Details Not Recommended

mold end of the sprue and the mold cavity proper; (3) *gate*, the orifice between the runner and the mold cavity; (4) *knockouts*, the assembly, comprising a rail and pins, which ejects the formed plastic part from the mold cavity; and (5) *mold shoes*, the members mounted between the mold cavities and the press platens to support the mold cavities.

For each of these mold elements, certain principles of design are preferable to others, because of the improvements in operating economy effected by their use. The more important of these principles and their application to the actual mold elements will be considered.

Design of Sprues

The first consideration of proper sprue design is assurance that any solidified plastic in the sprue be pulled free at the end of the molding cycle. Lodged plastic in the sprue is the cause of numerous delays when the castings are being removed from the sprue channel. In some stubborn instances, the front half of the die must be taken out of the machine. This source of delay can easily be avoided.

First, the diameter of the sprue opening at the point of contact with the nozzle should be at least 0.020 inch larger than the nozzle opening. This assures that the plastic string which breaks off in

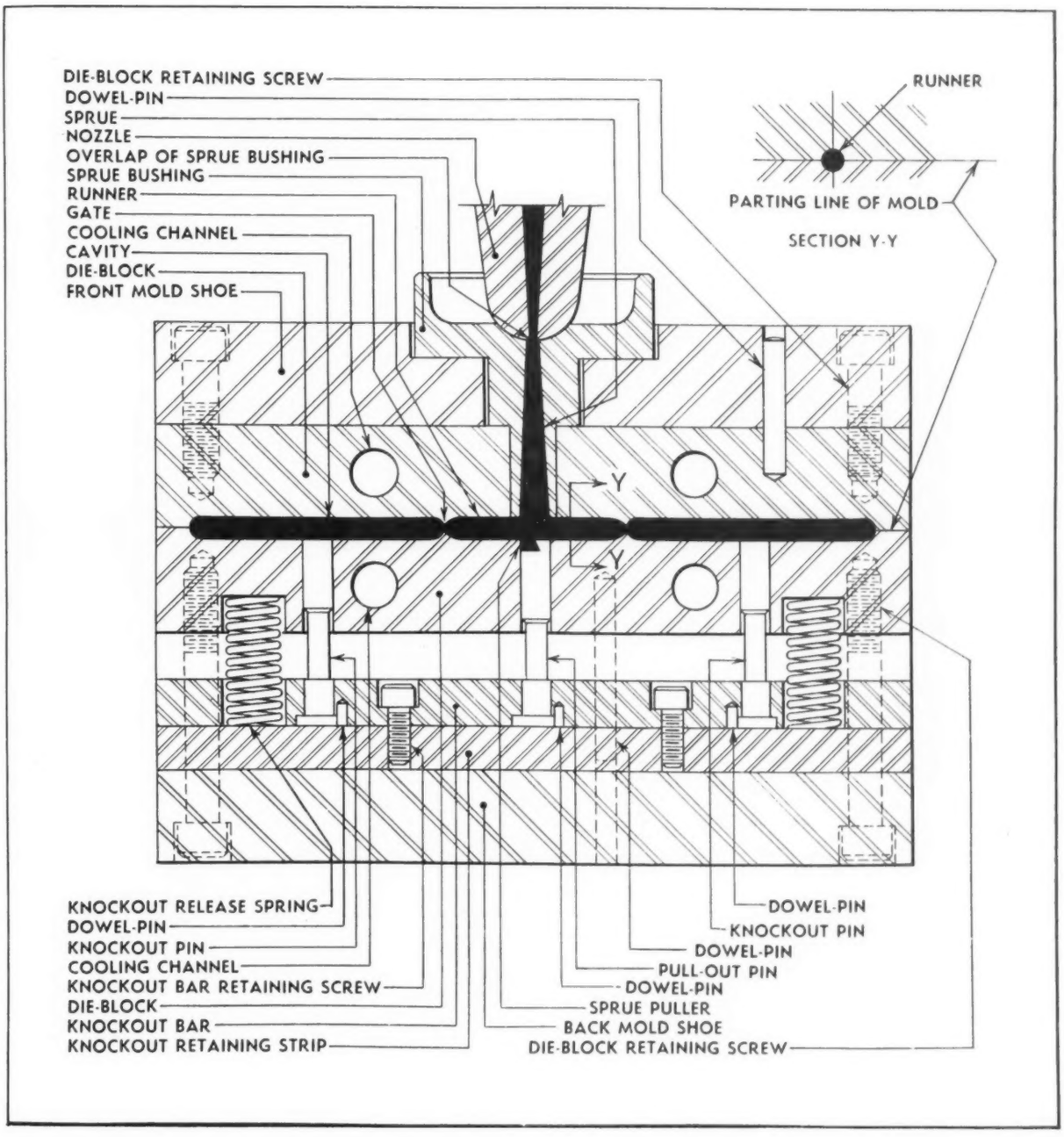


Fig. 2. Section of Injection-molding Unit Showing Preferred Construction of Mold Details

the nozzle as the mold opens for discharge can easily be pulled through. It also allows some leeway in die and nozzle alignment. A correct application of this principle is illustrated in Fig. 2. An exaggerated example of incorrect design is illustrated in Fig. 1.

Second, the sprue channel should be tapered sufficiently to permit easy removal of the sprue casting. It is preferable to have too great a taper than too small a one, as the slight amount of extra reworkable scrap cast in a sprue of excessive taper is more than compensated for by improved mold operation. Experience has shown that a taper of 2.5 degrees on each side, or a 5-degree included angle, is satisfactory. Less taper, down to as little as a 3-degree included angle, is permissible; but in that case, when the bushing that forms this part is being machined, more care must be taken to remove all lateral tool marks on the internal surfaces which might cause the sprue to stick.

A sprue bushing of the preferred type is shown in Fig. 2; Fig. 1 shows a less desirable type. It will be noted that the preferred type of bushing extends completely through the front mold-half to the parting line. This bushing construction, assuming a well polished internal surface, will prevent sprue lodgment. The construction shown in Fig. 1, where the bushing does not extend through the mold-half

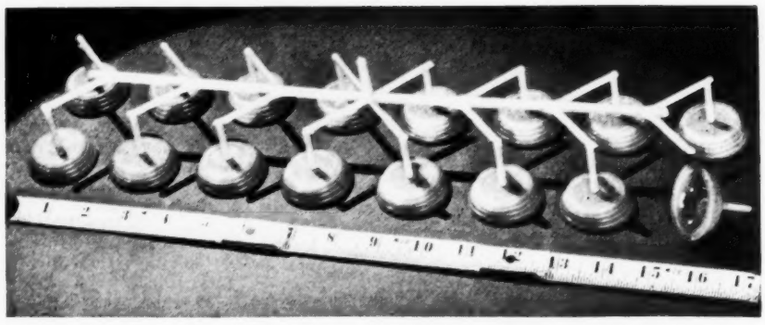


Fig. 3. Spider from Ring Mold Provided with Center Gating, Thus Eliminating Multiple Nozzles on the Injection Cylinders (Courtesy Guy P. Harvey & Son)

to the parting line, and the die-block is machined as a continuation of the sprue, is not efficient, because it is difficult to secure exact mating of the joint between the die-block and the bushing. The result is that there is often an under-cut at this point, causing the sprue to lodge. Furthermore, with this type of construction and with a relatively low bearing pressure on the nozzle, the bushing may move back out of the recess and permit the plastic to flow into the resulting opening, thus effectually locking the sprue in the channel. This is illustrated in Fig. 1.

To further guard against sprue lodgment, the bushing should be hardened, so that occasionally driving a lodged sprue out with the usual brass or soft steel rod will not deform the front opening of the sprue. Excessive hardness, however, should be avoided, because of the possibility of the bushing cracking from an abnormal bearing pressure on the nozzle.

Experience has shown that either the under-cut or hooked sprue pull-out, illustrated in Figs. 1 and 2, respectively, is satisfactory. Nevertheless, the type shown in Fig. 2 is generally preferable, because it requires less exacting design and die work than that shown in Fig. 1, which must be machined carefully to avoid too much or too little under-cut.

Runners or Feed Channels

Runners, or feed channels, are primarily lines of material supply to the mold cavities. The guiding principle of their design is that they be of sufficient size and of the best shape to convey sufficient material to the cavities in the least time and with a minimum loss of injection pressure. The use of runners of small cross-sectional area, and attempts to crowd into a mold one or two additional cavities by the use of inordinately long runners, although undertaken for reasons of economy, usually prove unsatisfactory, because the resulting reduction of runner scrap losses is usually more than offset by the higher percentage of molded parts that must be scrapped.

As further evidence against the use of runners of excessive length, experimental data shows that the injection-pressure drop between the nozzle and the cavities does not vary directly with runner length, but more nearly with its square. This point has assumed increased significance since the advent of copolymer vinyl, polystyrene, and polymethyl methacrylate resins which, because of their temperature-plasticity and other characteristics, yield improved molding results at highest injection pressures.

In connection with this point, experimental data also indicates the desirability of a greater unit pressure capacity on injection-molding machines than the current standard 20,000 pounds per square inch pressure at the end of the injection piston. Pressures as high as 60,000 pounds per square inch have been used experimentally by the author with good results. For general production, however, a pressure capacity of at least 30,000, and preferably 40,000 pounds per square inch, is desirable.

The shape of runners is a matter of considerable

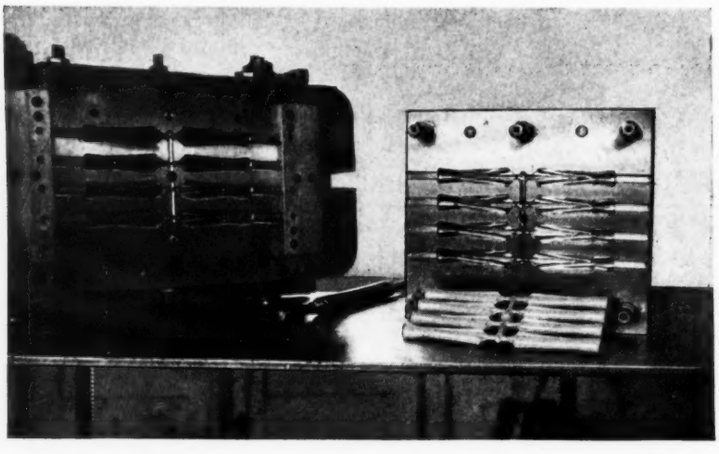


Fig. 4. Injection Mold for Brush Handles, Including Mechanism for Withdrawing Cores (Courtesy Guy P. Harvey & Son)

importance. The best results are obtained with those of circular cross-section, as illustrated in Fig. 2. This shape of runner, having the smallest possible surface area of any usable shape, results in a lower cooling rate of the plastic. Because of this, it introduces a minimum pressure drop. The use of such a runner, however, necessitates the machining, with proper register, of both halves of the die, so as to form the channel. To avoid this, gates of semicircular or rectangular cross-section, as shown in Fig. 1, are often used. These require the machining of only one of the die-halves, and can be used satisfactorily when runners are short. In any case, however, it is highly desirable for the sake of the appearance of the molded castings to finish-machine and polish the surfaces of the runner channels.

Often, particularly in dies that do not require core-pulling, it is possible, by arranging the cavities radially about the sprue instead of in one or more straight lines, to use minimum-length runners, which are desirable because of their smaller pressure drop.

Construction of Gates

The primary consideration in designing the gate of a mold cavity is that it be of such a shape and size as to permit consistent cavity filling under normal injection pressure. Furthermore, it should be so located with respect to the mold cavity as to take advantage of optimum flow conditions in the casting. A third factor in gate design is that it should permit simple and inexpensive trimming and finishing operations. The sacrifice of the first two considerations in favor of the third, however, is false economy because of the higher percentage of rejected castings that would result.

Early in the history of injection molding, it was believed that the gate should be of extremely small cross-sectional area, because of the heat of friction imparted to the resin mass as it entered the mold cavity. This is not in accord with more experienced observations, which now show that gates of extremely small cross-section greatly reduce the effective molding pressure, and have no advantage over larger gates, except in ease of finishing. The latter factor is outweighed by the improved molding results accompanying the use of larger gates.

It is manifestly impossible to establish hard and fast rules for determining gate sizes which will apply to all conditions. This is true, not only because of the infinite number of shapes and sizes, and the varying qualities of castings, but also because of the differences in flow of the various molding materials, some of which, of course, require larger gates than others. However, the principle of cut-and-try can, and should, be applied to the determination of gate size. To do this, the best practice is to start with gates of minimum cross-sectional area, and enlarge the gate area as indicated by the molding results obtained with the plastic material ultimately to be used. In the course of the trials, enlargement can usually be performed with a hand-grinder while the die is in place in the machine. Once the proper size has been established, the die can, if necessary, be removed from the machine, and the gates finished and polished.

Where possible, as in runners, gates having a round or elliptical shape are preferred. This is not always permissible, however, particularly in instances where a gate of such a shape and of an adequate size would be too large in proportion to that part of the casting at the point of entrance and would introduce finishing problems. In such cases, flared rectangular gates of appropriate thickness and width should be employed.

In order to provide the best flow conditions, gates should be located with respect to the mold cavities so that the ratio of cross-sectional area of the cavity at the gate location to the cross-sectional area of the gate is as small as possible. Put differently, this means that gates should be placed on a relatively thin part of a casting, so that the flow of material filling the cavity is from smaller toward larger cross-sectional areas of the cavity. Moreover, due consideration must be given to the fact that injection-molded castings are generally weaker mechanically at the gate sections than elsewhere; so the gate should not be placed where the casting would be weakened to the point of breakage during normal use.

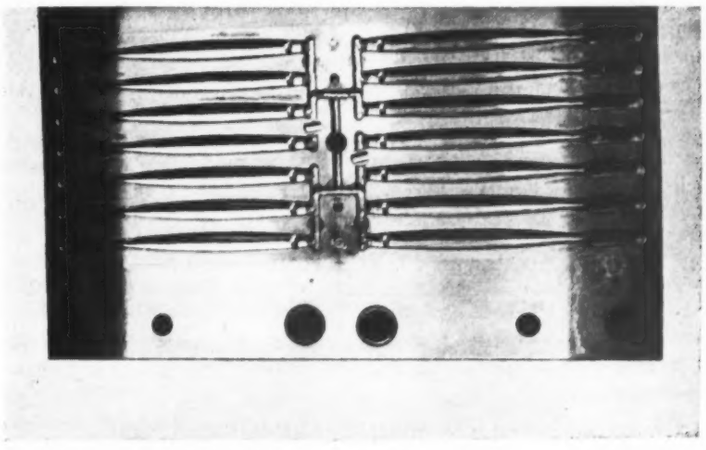


Fig. 5. Port Side of Toothbrush Handle Mold, Showing Gating and Cavity Shut-off Plugs (Courtesy Guy P. Harvey & Son)

Weld lines or marks in the finished casting are other factors to be considered in the selection of gate locations. If, by nature of the direction and condition of flow of the plastic, they are likely to be formed on the molded part, the gate should, if possible, be located so as to throw them into inconspicuous locations.

Formation of Cavities

Two methods are generally used in die construction. In the first, as illustrated in Fig. 2, the cavities are formed directly in a solid die-block, or, where this is impractical, in several blocks, which are then assembled in proper relation to each other on a suitable shoe. In the second method, as illustrated in Fig. 1, each cavity is formed in an individual small block, which is then assembled in the main die-block as an inserted member.

Of the two methods of construction, the former is generally preferable, because it permits more accurate and permanent register and miter of the individual cavities. However, the second method is satisfactory if the inserts are carefully fitted in the die-block, so as to avoid any cracks or joints which might open under the applied pressure and become filled with plastic. Also, when the second method of construction is used, the inserts should not be held in place with recessed or hollow-head screws set in the parting faces of the mold, as shown in Fig. 1, because such recesses become filled with plastic when the mold flashes, as is bound to occur occasionally. These recesses must then be cleared—a time-consuming job—or the plastic projecting from them will interfere with proper closing of the mold in subsequent operations.

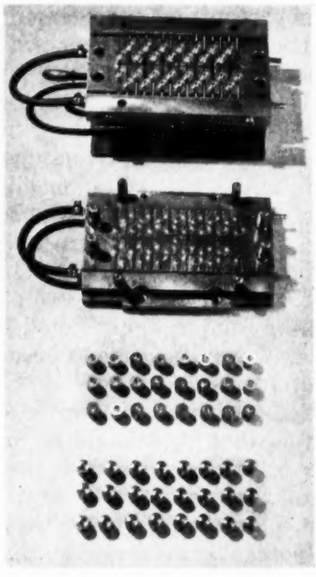


Fig. 6. Shank-button Mold with Replaceable Cavity Inserts (Courtesy Thomas Mason & Co.)

In order to permit ejection of finished castings, the sides of all mold cavities should taper toward the parting line of the mold. This is particularly true of castings involving deep draws, such as boxes and pencil barrels. In the molding of polystyrene and copolymer vinyl resins, this taper is especially significant, because these materials show less shrinkage in the mold than cellulose derivatives. A taper of 0.5 degree on each side of a cavity has been found to be satisfactory for proper ejection. A taper this small will not ordinarily be objectionable from the standpoint of the design of the casting. Likewise, cores that are to be pulled from a casting should carry a 0.5-degree taper in the direction opposite to that in which the core is withdrawn.

It is also highly desirable, when possible, to pull the cores while the molded part is still held in place in the mold cavity and before the knockout pins have had an opportunity to engage and move the molded part away from any cavity shoulders or surfaces against which it might otherwise securely anchor during core-pulling. This, naturally, assures positive withdrawal of the core with a minimum chance of broken castings.

Thin-Walled Castings

The molding of castings having extremely thin walls of appreciable length should not be attempted by conventional injection methods. For instance, the molding of a tube 1 inch in diameter and 3 inches long with a 0.020-inch wall thickness is impractical, if not impossible, by ordinary injection-molding methods. This is true because a plastic mass chills so rapidly in such thin sections that the resistance to movement set up in the mold cavity by the solidified plastic overbalances the injection force in an early stage of the injection, preventing further filling. It is difficult to establish principles that will apply to this phase of the problem of mold design; but, in general, sections of less than 0.050-inch thickness should be avoided, except when paths of travel are short and when high injection pressures are available.

Heavy Sectional Castings

Castings of abnormally thick or heavy sections likewise present a problem to the mold designer in that they are likely to show flow marks, shrinkage marks, and sometimes voids or bubbles. These defects are particularly objectionable in parts produced from transparent materials. The occurrence of flow marks represents a failure of the mold cavity to become filled completely prior to the time the plastic has cooled from contact with the cold cavity surfaces enough to weld properly. The solution of this condition lies in the use of sprues, runners, and gates of sufficient size not to impede flow and thus to permit the plastic mass to enter the cavity in the allowable time. In addition, care must be exercised to be sure that the injection nozzle itself is sufficiently large in diameter not to act as a bottleneck, as otherwise, even oversize gates and runners will not be effective in overcoming the trouble.

Shrinkage marks and voids result from the volumetric change of the plastic mass in the mold cavity between its plastic and solid phases. Shrinkage marks represent a volumetric change, the effect of which has localized on the casting surface; voids

are the result of "freezing" the surfaces, so that shrinkage takes place in the softer central portions of the casting. These conditions can be overcome by the use of gates and runners sufficiently large in section to cool at a rate slow enough to permit fresh plastic to enter the cavity during part of the time interval of the piston dwell. Small gates or runners which "freeze" quickly obviously defeat this principle.

It will be apparent that high injection pressures are advantageous in overcoming these conditions, since, through a gate of a given size, the amount of material that can be moved per unit of time is a function of the applied pressure. On castings with large flat areas where shrinkage marks are likely to appear, such areas should be broken up by the use of decorative, embossed, or engraved figures or by designing the mold cavity so that the part is slightly convex instead of flat. Otherwise even slight and normally indistinguishable shrinkage marks will be clearly visible.

Mold Cavity Vents

In order to facilitate filling the cavities with minimum injection pressure and to prevent burnt castings due to the heat derived from entrapped and highly compressed air, mold cavities should be vented. In general, vents should be placed at those sections of the cavity in which the final stages of flow take place, as it is in these sections that air is usually trapped.

Vents having a depth of between 0.002 and 0.003 inch should be employed. The proper width is best established by cut-and-try methods, but any error should favor an excess of venting capacity, as there is nothing to be lost thereby. It is particularly desirable to vent cavities at the weld lines or junction points where two or more resin streams meet and fuse into a solid mass. Release of entrapped air at these points permits intimate contact between the converging resin streams, and thus results in improved strength and appearance of the molded part.

At weld points between converging streams that have undergone relatively long travels and have thus been subject to considerable cooling, it is generally desirable to employ, in the die-block, a small reservoir or auxiliary cavity external to the mold cavity and connected to it by a small gate or runner. The purpose of the auxiliary cavity is to draw off from the mold cavity the leading, coldest—and least likely to weld—portions of the converging plastic masses, and to introduce a condition of turbulence at the junction, thus inducing improved knitting and better strength in the molded part at that point. In finishing operations, this reservoir is trimmed off the casting in exactly the same manner as a gate.

The application of vacuum to mold cavities, as a means of aiding the normal venting action, is beginning to receive some attention, and may, for some types of castings, prove highly desirable. When used, it is important that the vacuum applied be very high and that the vacuum apparatus have ample capacity to scavenge the mold cavity during the interval between the mold closing and the entrance of the injection stream into the cavity. The details of accelerating the venting of the mold by vacuum must be established for each particular casting involved. Only when this is done, and venting problems are definitely indicated, are the required effort and accessory vacuum equipment justified.

Since nearly all injection molds are run comparatively cold, adequate provision should be made for the circulation of a cooling medium through them. Assuming an adequate supply of coolant at a suitable temperature, coring channels of 1/4 to 3/8 inch in diameter are large enough for ordinary molds of capacities between 1 and 4 ounces. For molds of capacities from 4 to 8 ounces, 1/2- or 5/8-inch coring channels are generally large enough. The coring lines should preferably be located in the die-block to exert a maximum cooling effect on the casting. They should not, however, be located close enough to the cavities to make possible the collapse of the cavity wall from the force of the injection pressure.

Design of Knockout Assemblies

Knockout assemblies should be incorporated in all molds to provide smooth and easy ejection of the castings. This assembly properly comprises a number of pins, mounted on a suitable rack or rail for governing their movement, and terminating in the mold cavities. An adequate number of pins should be employed in each cavity, and, in some instances, in the runners, to assure uniform motion of all parts of the castings at the time of ejection and to avoid any cantilever action which might cause the casting to hang up in the mold and be damaged.

The head of each knockout pin should also be large enough in area to distribute the applied force in such a manner as not to punch through the casting. When there are size limitations on pin diameters, it is generally possible to use a greater number of pins. In cases where knockout-pin marks on castings may be objectionable, the heads of the pins can often be engraved with a trademark or other decorative figure to prevent the marks from showing.

Figs. 1 and 2 show two different knockout assemblies, the type shown in Fig. 2 being preferred. It will be noted that the knockout pins shown in Fig. 2 are designed with relieved shanks to prevent them from galling or sticking in the pin channels. It is preferable to harden the cavity end of each knockout pin and have the other parts soft, as this allows some pin deflection without breakage. The pins should also be assembled on the knockout bar by a positive construction, as shown in Fig. 2, and not by a force-fit construction, as illustrated in Fig. 1.

A positive means, such as the use of springs, should always be employed for moving the knockout rail back into the disengaged position when the mold is closed. Pressure of the plastic mass in the mold cavities on the knockout pins should not be depended on to move the knockout rail back into its proper position, because movement of the pins after the injection is partially completed is likely to cause flow marks in the castings.

Mold Shoes and Mountings

Mold shoes and mountings serve two purposes: First, they provide a means for mounting the mold in the press, and, second, they provide a means of support for the actual die-blocks or mold-cavity walls. The latter of these functions is extremely important, and neglect of it in mold design is likely to carry a heavy penalty in the form of flashed castings and possible permanent distortion of the mold. Support should be provided for the die-block or cavities by the mold shoes in all permissible areas. It is usually possible to provide positive supporting members for all parts of the front die-block except in the area occupied by the sprue bushing.

In the rear mold-half, because provision for knockouts must be made, positive support of the die-block at all points is impossible. To improve this condition, knockout rails and their recesses in the mold shoes can be designed to be as narrow as possible, so as to provide the maximum supporting action of the mold shoes. The mold shoes and other supporting members should be of rugged and heavy construction, in order not only to support the die-blocks, but also to impart rigidity to the mold and prevent it from bowing open under the injection pressure. Molds that are to be employed in machines having relatively large openings in the front platen, through which the mold and nozzle make contact, should be designed with especially thick shoes in order to overcome deflection in the area of the platen opening.

All commercial injection-molding machines are rated as to clamping force and, theoretically, a machine rated at 100 tons clamping pressure should withstand an opposing force of 100 tons applied in the mold cavities by the injection pressure. In actual practice, however, even though properly heated and plasticized injection-molding materials never reach a truly fluid condition, the projected area of the castings should be such that the total pressure exerted—the product of the projected casting area and the theoretical unit pressure on the material in the heating cylinder —is not over 90 per cent of the theoretical clamping force. This is a safeguard against flashed molds and scrap castings.

Obviously, not all the foregoing suggestions apply to every mold. Nevertheless, attention to the details mentioned, in cases where these ideas are adaptable, will be found to yield practical operating advantages.

Metal Spraying with an Electric-Arc Gun

A new method of metal spraying has been developed by Dr. M. U. Schoop of Switzerland, originator of the metal-spraying process, which makes use of a spray gun utilizing an electric arc to melt the metal to be deposited. Hitherto, the metal-spraying process has depended upon a gas flame of some kind to melt the metal before being deposited on the base surface.

The new Schoop process, introduced into the United States by Herman A. Holz, 116 W. 14th St., New York City, consists essentially of short-circuiting two conducting wires which pass through the spray gun, atomizing each drop of metal melted by the resulting arc, and projecting the atomized metal by means of a compressed air blast on the surface to be metallized. A small luminous arc is formed at the breaking point, insuring the continued melting of the wires, which are constantly being fed forward by means of a turbine. Although the compressed air blast directed through the arc may be fed into the gun at pressures ranging from 60 to 120 pounds per square inch, the arc is reported to be entirely stable.

The new process of metal spraying is claimed to be highly economical and efficient. It is said that about twenty-two pounds of carbon steel or stainless steel wire can be sprayed with the Schoop Electro-Gun during each hour of operation. In many cases, the pre-treatment of the surfaces by sand-blasting, heretofore required, can be dispensed with because of the increased strength of bond secured by this method of deposition. Thus, if a glass plate is electro-metallized with aluminum or steel by this process, and an attempt is made to remove the deposited metal, a layer or "skin" of glass will also be torn off. It appears that, owing to the electric arc, the temperature of the sprayed metal particles is so high that they melt into the surface against which they are propelled, rather than becoming merely a surface layer.

In combination with hard alloy wire, the electric metallizing process has been found applicable to the production of low-cost die-molds for plastics. The basis of these molds is plaster-of-Paris, wood, or other material which can be readily shaped to the required form, and this basic section is then electro-sprayed with a suitable alloy.

The normal air pressure of the process is increased at certain stages during the operation by as much as 100 per cent; and the compressed air may be mixed with nitrogen. Very hard metal sections are thus obtained.

There appear to be many possibilities for the application of this process in actual production work, as well as in various repair operations. The utilizing of different combinations of metals and also of various metal layers to secure a particular structure or mechanical property are possible avenues of experimentation.

Packing Machines for Export

Detailed Directions for the Preparation of Machines for Packing and the Construction of Packing Cases and Crates for Foreign Shipment

By JOSEPH LEEMING
Transportation Division
Bureau of Foreign and Domestic Commerce
Washington, D. C.

IN 1939, industrial machinery exports from the United States were valued at nearly $290,000,000, representing more than 17 per cent of the country's total exports of finished manufactures. Because of the importance of proper packing of machinery and machine products for export shipments, the Transportation Division of the Bureau of Foreign and Domestic Commerce has brought out a 530-page book entitled "Modern Export Packing" which gives detailed information on the subject for the benefit of American manufacturers of industrial equipment who are engaged in export trade. The present article is condensed from the machinery section of the book mentioned, and presents the basic principles to be taken into account in preparing machinery for export and in constructing packing cases and crates.

Excellent export packing methods, which it would be difficult to improve upon, have been developed by many American machinery manufacturers who have been regularly engaged in overseas trade for a number of years. Each year, however, there are a number of companies that enter the export field for the first time and, in some cases, their packing is not adequate to withstand the numerous hazards of foreign shipment. Instances have been reported recently, for example, of heavy machines that have been placed in export cases without being bolted or otherwise secured in place, with the result that the cases have been torn apart by the movement of the contents. In other instances, cases have been built of too light material or have not been fitted with cross-bracing at top and bottom to resist the pressure exerted by the loading slings used to hoist cargo aboard ocean vessels.

Basic Factors to be Considered in Crating Machinery

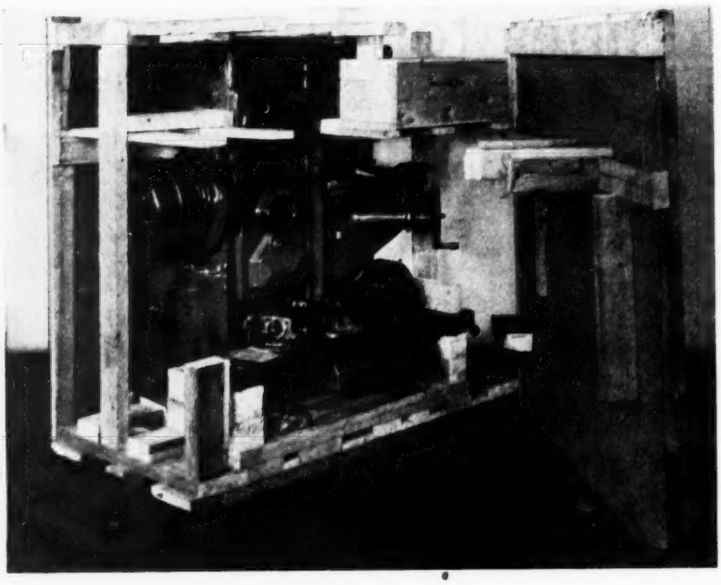
A number of factors must be given careful consideration in determining the best method of packing and the best type of case or crate to use for the export packing of any specific machine. The four major points to be considered are: (1) Provision of sufficient strength to resist the handling involved in ocean transportation; (2) method of securing the machine inside the packing case; (3) protection against rust and corrosion during the ocean voyage; and (4) design of a container of the lowest practicable cubic measurements, in order to secure lowest possible ocean freight charges.

Surface Grinder Blocked in Position on the Skid Unit, preparatory to Boxing

These problems involve consideration of the weight of the machine and its resistance to breakage; the extent to which it can or should be disassembled; attachments to be separately boxed or crated; transportation facilities between the point of origin and inland foreign destination; heavy lifting facilities (if any) at port of discharge or on the steamer carrying the shipment; slushing oils or other rust preventives; dimensions of lumber to be used for skids and braces; proper size and spacing of nails or bolts; and customs regulations in country of destination.

The general principles that are important to observe in either crating or boxing machines for export are:

1. Platform and skids must be strong enough to support the entire machine, and the platform should usually be attached to the skids by means of heavy bolts or spikes. The latter should be "toed" in on a slant both ways to keep the boards from lifting when a bar is used to move the case.



Milling Machine being Boxed, Showing Interior Bracing and Blocking to Prevent Movement of Machine during Transportation

2. The size of the case should be such that, when squared up for length, width, and height, there will be an inside clearance of at least 1/2 inch.

3. The machine should be so blocked in position that if tipped over, the weight will be properly supported and all delicate parts protected. Blocking should be placed lengthwise of the grain, so as to be less affected by swelling or shrinking.

4. The top of the case and its supports should be sufficiently strong to support any crushing strain due to heavy cargo being placed on top, and the transverse strength of the case must be such that the case can resist the effect of crushing when it is raised with slings.

Preparation of the Machine for Packing

Before packing, all removable, projecting, or unsupported parts that might be broken by impact against the inner walls of the case during transportation should be detached. Tools, accessories, loose attachments, and light or medium heavy and comparatively small machine parts that might be displaced in rough handling, or that cannot be securely fastened in place on the machine, should also be removed. These articles are sometimes packed and shipped in a separate box; at other times, the box is enclosed in the case containing the machine. If the box is placed inside the packing case, it should be securely nailed or spiked and strapped to the skids or to the bottom of the case; otherwise, it is likely to cause damage by moving during transportation or handling. After removing loose parts, the machine should be examined to determine if there are any parts that are not fastened rigidly in place. If so, they should be wired or otherwise securely fastened.

The question of disassembling a machine for shipment is one that should be discussed with the engineer who originally designed the machine or with someone who is acquainted with the strength of the various parts. In many instances, disassembly can be effected to a greater extent than would at first glance appear feasible, and frequently results in greater safety to the machine, and in the use of a smaller packing case, with resultant savings in ocean transportation charges.

When disassembly has been completed, all finished and unpainted metal surfaces should be sprayed or otherwise treated with a slushing oil or compound to prevent rust or corrosion. If, as is frequently the case, grease is used for this purpose, care should be taken to obtain a product that will not melt and run off at temperatures encountered in the hold when the ship is in tropical waters. If the machine to be protected is partially painted, the protective covering should be of such quality that it will not soften, and will not discolor or otherwise injure the paint. In many instances, a coating of some material such as asphalt, lacquer, or varnish is to be preferred, because it dries readily and eliminates the smearing of adjacent surfaces. The latter materials are particularly useful on nickel- or chrome-plated parts, which sometimes become corroded from salt air if not protected.

Construction of the Skid Unit

When a machine is to be mounted directly upon and secured to the skid unit, the latter should be constructed with four skids, one at each side of the case, and the other two centered beneath the bolt holes in the base, end frames, or legs of the machine. If the machine has a flared base which might be broken if the case were dropped, a fifth skid should be placed in line with the center of the base. With leg type machines that have legs with no bolt holes, the two intermediate skids should be placed directly beneath the legs. With base type or end-frame type machines that have no bolt holes in the base or end frames, the skids may be spaced evenly apart.

Three skids are usually sufficient for machines that are not to be mounted directly on the skid unit, but on a cradle, saddle blocks, or the like. An additional skid or skids will be required, however, for exceptionally heavy machines or unusually wide cases. Two skids will generally be sufficient when machine parts are mounted on heavy saddle blocks and the skid unit is not more than 3 feet wide.

For machines that weigh up to 10,000 pounds and are not more than 12 feet long, skids of 4- by 6-inch material are sufficient. For machines that

weigh from 10,000 to 25,000 pounds and are not more than 12 feet long, or for machines that weigh up to 10,000 pounds and are longer than 12 feet, 6- by 8-inch skids (8-inch surface vertical) will be required. Each end of the skids should be mitred at approximately 45 degrees and approximately 2 inches up from the under surface to facilitate their being pushed on the rollers used for moving heavy cases.

The engineers of the Freight Container Bureau of the Association of American Railroads recommend that skid-unit sheathing should be of 1- by 6-inch material, tongued and grooved, for base type machines that weigh up to 10,000 pounds and are not greater than 3 feet wide over all. For base type machines that weigh up to 10,000 pounds and are greater than 3 feet wide over all, or for base type machines that weigh from 10,000 to 25,000 pounds, regardless of width, the skid-unit sheathing should be of 2- by 6-inch tongued and grooved material. For leg type or end-frame type machines, 2- by 6-inch tongued and grooved material should be used, regardless of the weight or width of the machine.

In applying the sheathing, the 1- by 6-inch sheathing should be nailed to each skid with 12-penny cement-coated nails, and the 2- by 6-inch sheathing should be nailed to each skid with 20-penny cement-coated nails. The entire surface of the skid unit should be covered with waterproof paper, overlapped at least 4 inches at the joints between the sheets. When the paper is in place, two 2- by 4-inch nailing strips should be nailed to the sheathing and skids, one flush with each end of the skid unit. Each nailing strip should be 4 inches shorter than the width of the skid unit, and each strip should be centered on the width of the skid unit.

Sides and Ends of the Export Case

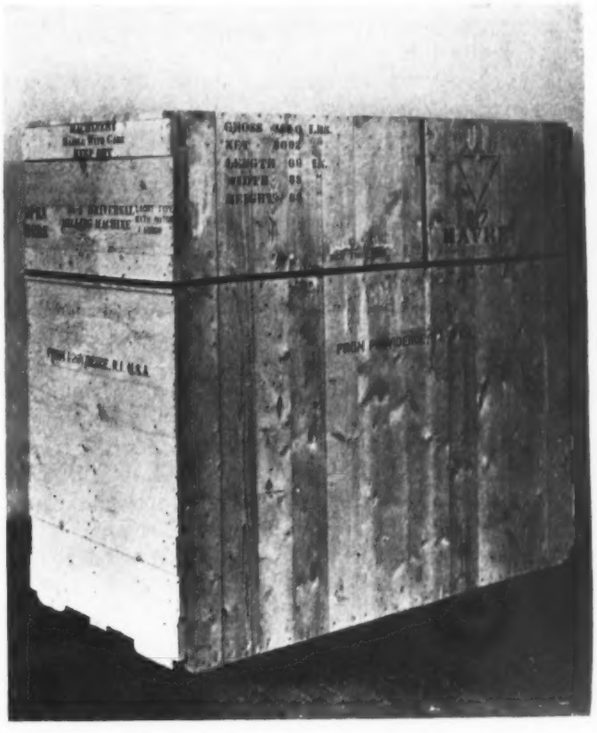
The side units of the export case should be constructed with a rectangular framework of 2- by 4-inch material consisting of a top rail, a bottom rail, and a sufficient number of uprights, evenly spaced apart, to break the framework up into a number of approximately square panels, except that the uprights should not be spaced more than approximately 4 1/2 or 5 feet apart. For machines weighing over 5000 pounds, the top rail should be of 2- by 6-inch material instead of 2- by 4-inch material. The length of the rails should be equal to the length of the skid unit minus twice the actual thickness of a piece of 2- by 4-inch material. The length of the uprights should be such that there will be ample clearance between the machine and the top cross-pieces and the top sheathing of the case.

It is recommended that the end panels on each side should be provided with a diagonal brace of 2- by 4-inch material. If there is only one panel on the side unit, cross-diagonal braces should be provided, one brace to consist of one piece of material, and the other of two pieces with the inside ends mitered against the one-piece diagonal brace.

The side-unit sheathing for machines weighing up to 15,000 pounds should be of 1- by 6-inch tongued and grooved material; and for machines weighing over 15,000 pounds, it should be of 2- by 6-inch tongued and grooved material. The length of the sheathing should be equal to the over-all height of the framework plus 1 1/2 to 2 inches less than the over-all height of the skid unit. Before applying the sheathing, the entire framework should be covered with waterproof paper. The sheathing should then be applied vertically, with the upper ends of the sheathing flush with the top of the framework and with the sheathing overlapping the end uprights by an amount equal to the actual thickness of a piece of 2- by 4-inch material. The sheathing should be securely nailed to each framework member with 8-penny cement-coated nails when the sheathing is of 1- by 6-inch material, and with 16-penny cement-coated nails when the sheathing is of 2- by 6-inch material.

The end units of the case should be constructed with a rectangular framework of 2- by 4-inch material consisting of a top rail, a bottom rail, and a sufficient number of uprights, evenly spaced apart, to break the framework up into a number of approximately equal square panels. The length of the uprights should be equal to the length of the uprights on the side units minus the actual thickness of the 2- by 4-inch nailing strip secured at the ends of the skid unit, so that when the side and end units are secured to the skid unit, the top edges of the side and end units will be even.

The end panels of the end units should be provided with diagonal braces similar to those recom-



Assembled Export Case for Shipping Milling Machine

mended for the side units. The end-unit sheathing should be of the same sized material as that of the side units. The length of the sheathing should be equal to the over-all height of the framework plus the actual combined thickness of the 2- by 4-inch nailing strip on the skid unit and the skid-unit sheathing. The framework should be covered with waterproof paper, and the sheathing should be applied vertically, overlapping the end uprights by an amount equal to the actual thickness of the side-unit sheathing.

Assembling the Case

In assembling the export case, the side units are placed at each lengthwise edge of the skid unit, framework facing inward, with the ends of the sheathing that overlap the bottom rail of the framework resting against the side of the skid unit. The bottom rail of the framework should rest on the ends of the skid-unit sheathing, and the ends of the side unit should be flush with the ends of the skid unit. The lower ends of the side-unit sheathing are nailed to the skid unit, using 12-penny cement-coated nails when the side-unit sheathing is of 1- by 6-inch material, and 20-penny cement-coated nails when the side-unit sheathing is of 2- by 6-inch material.

The end units are positioned so that the ends of the sheathing that overlap the bottom rail of the framework rest against the ends of the skid unit, and the bottom rails of the framework rest on the 2- by 4-inch nailing strips. The vertical edges of the end units should properly engage the vertical edges of the side units. The lower ends of the skid-unit sheathing are nailed to the nailing strips and sheathing of the skid unit, using the sizes of nails used for the side units.

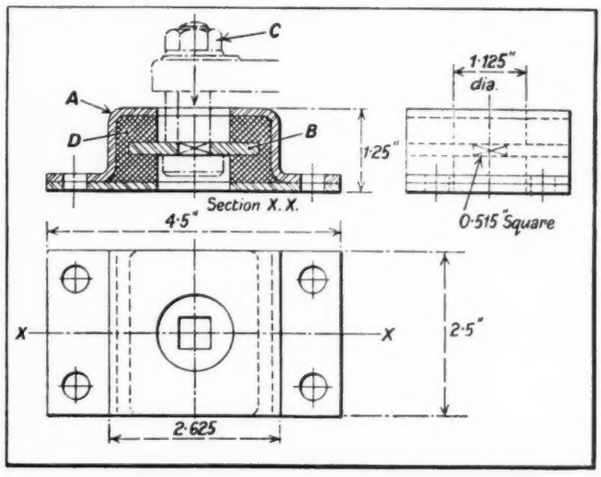
Top cross-pieces should be applied across the top of the case in order to reinforce the top against crosswise sling pressure. When the case is tall or fairly tall, and of such length and width as to make it impracticable to stow other cases on top of it in the hold of the ship, the top cross-pieces may be of 2- by 4-inch material. When the case is low or fairly low, and of considerable length and width, so that other cases may be stowed on top of it, the top cross-pieces should be of 4- by 6-inch or 6- by 6-inch material. The cross-pieces should be cut to a length equal to the distance between the top rails of the two side units, measured at one end of the case. A cross-piece should be placed directly above each pair of uprights in the side-unit framework, larger dimension vertical, with the upper edge flush with the top of the case. The ends of the cross-pieces should be toe-nailed to the top rails of the side units.

The top sheathing should be of the same material as that used for the side-unit and end-unit sheathing. Before applying it, the top of the case should be completely covered with waterproof paper. The top sheathing should then be applied lengthwise of the case and should be securely nailed to the top of the side and end units and to the top cross-pieces, using 12-penny cement-coated nails when the top sheathing is of 1- by 6-inch material, and 20-penny cement-coated nails when the top sheathing is of 2- by 6-inch material.

* * *

Vibration Absorbing Mounting for Electric Motors

An interesting vibration absorbing mounting, in which rubber is bonded to metal, has been developed by the firm of Metalastik, Ltd., Evington Valley Road, Leicester, England. This particular mounting is designed to support electric motors; as shown in the accompanying illustration, it consists of three parts. A steel casing *A* is bolted to the machine or support to which the motor is to be



Vibration Absorbing Electric Motor Mounting

attached. A center plate *B* serves to carry the bolt *C* which is attached to the motor base. The rubber at *D* is the vibration absorbing material, and this is bonded to both casing and plate.

It will be noted that while the motor is free to vibrate in any direction, these vibrations are completely isolated from the mounting, due to the arrangement of the center-plate support. As designed, this mounting will withstand a load of 500 pounds before excessive bulging of the rubber takes place. Similar mountings are said to have been found useful in the machine tool industry for isolating the vibrations of electric motors from machines.

* * *

A new machine depreciates—it becomes obsolete, it has to be written off. But a new worker *appreciates;* as he learns and grows in knowledge and accomplishment, his value becomes greater. Certainly it is important to evaluate his potentialities correctly.—*George V. Trundle, Jr.*

Electronic Pin-Hole Detection in Sheet Steel

How the Electric Eye is Employed in Strip Mills to Detect Minute Pin-Holes in Sheet Metal

By G. E. STOLTZ
Manager, Metal Working Section
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

DURING the rolling of steel strip to the thin gages used for black and tin plate, minute holes are sometimes found in the finished stock. The cause of these tiny pin-holes may be rough mill-roll surfaces or, more likely, occasional slag inclusions in the steel itself. The holes are usually very small, being roughly from 0.010 to 0.020 inch in diameter. Some products, for instance cans for food, cannot be used if there is a hole, no matter how small, in the steel from which they are made. Hence, steel companies have to inspect every sheet closely in order to detect these imperfections. Such inspections were formerly accomplished by personal observation, thus adding another step to an already complicated inspection procedure.

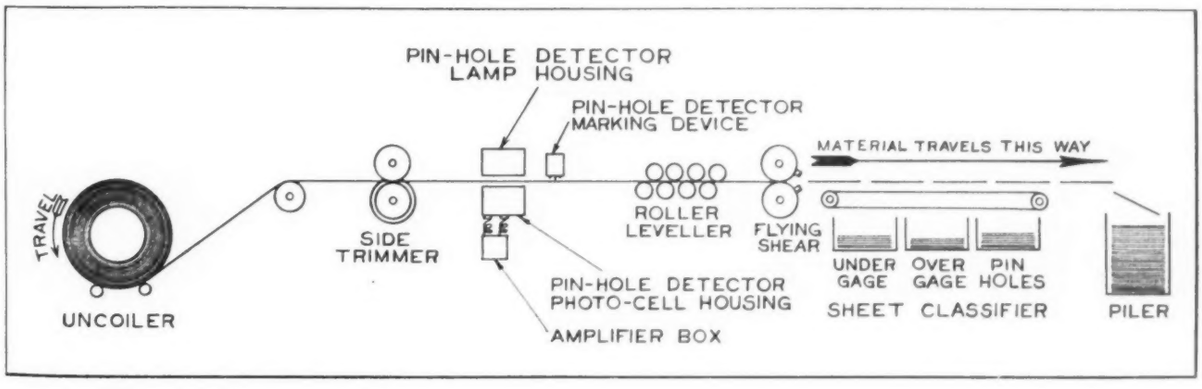
Because human error is always present, the steel industry began a search for a means of automatic inspection that would detect these pin-holes, and also automatically reject the sheet containing them. The answer was found in an electronic device, aptly named a "pin-hole detector."

The elementary operating units of the pin-hole detector consist of a light source, photo-tubes, and a control unit. The hole detector is usually mounted on a tin-shearing line where the continuous coiled steel strip from the temper-pass mills is side-trimmed and cut to its required size. These shearing lines operate at speeds as high as 800 feet per minute, and have an automatic rejection arrangement for "off gage" sheets.

When the hole detector is used, some sort of automatic rejection or marking of the strip is employed to get rid of pieces containing pin-holes. The operation of the device is very simple. The continuous strip of steel passes through the detector between the light source and the photo-tube element. As long as there are no holes in the strip, no light will reach the sensitive photo-tubes; but as soon as a hole permits light to strike the photo-tube, a current impulse is started.

The control unit consists of an amplifier and a thyratron panel. The amplifier serves to magnify the current impulse caused by the light that shines through a hole in the strip striking the photo-tube. Three resistance-coupled stages of amplification are employed, the first stage being non-microphonic in order to prevent a reduction of sensitivity due to pick-up caused by mechanical vibration. To further protect the amplifier from the effects of vibration, it is spring-suspension mounted, usually directly below the housing for the photo-tubes.

The amplified current impulse is fed into the thyratron panel, where it is impressed on the grid circuit of the thyratron tube. This tube functions as an instantaneous locking relay, and can detect impulses lasting only approximately 1/5000 second. The output of the thyratron operates a relay to give indication of a hole. The system is reset by a thyratron time-delay relay located on the thyratron panel.



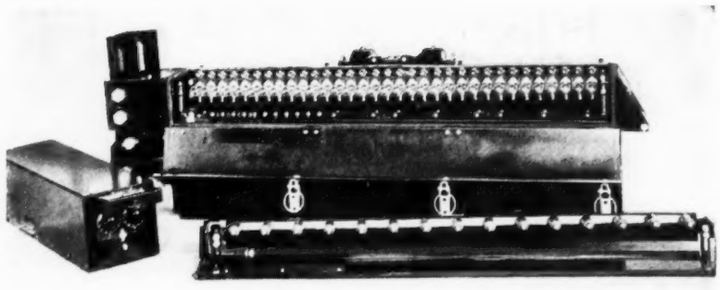
The Pin-hole Detector as it would be Mounted in a Shearing Line. The Steel Strip Passes through the Space between the Light Source and the Photo-tubes Directly below it. The Amplifier is Suspended on Springs to Minimize Vibrational Shocks

There are three common methods of removing imperfect sheets after detection: (1) Stopping of the line for immediate removal; (2) marking of the strip for later removal; and (3) automatic operation of a classifier or sorting machine located behind the shear.

When continuous strip is being sheared, the first method is hardly, if ever, used. However, should the finished product be in coil form, it may be necessary to remove the part with a hole where found, as, for instance, in copper coils.

The strip-marking device, which is in somewhat common use, is mounted in a dust-tight cabinet just behind the detector itself, and consists of a marking stylus which is attached through mechanical linkage to the moving pole-piece of a solenoid. When a hole is spotted, the solenoid operates after a preset time delay, dropping the stylus so that it comes in contact with the sheet. A pilot generator, geared to the shear line, provides an indication of its speed, which the marking device control translates into a time control of the stylus solenoid, so as to give an approximately constant marking length, regardless of line speed. The length of the mark is adjustable from about 10 to 20 inches.

The light source of the detector is enclosed in a dust-tight, force-ventilated steel case, which is mounted above the moving strip. It provides intense illumination over the full strip width by means of several overlapping line filament lamps and cylindrical lenses. The thirty-three 10-volt exciter lamps used are wired in series-parallel with eleven lamps in each bank. They operate at reduced voltage to lessen the heat generated and to prolong lamp life. Neon lamps are placed in parallel across the operating lamps, so that in case of burn-outs, the neon lamp will indicate the defective exciter lamp by glowing. Forced ventilation is provided by a double-bladed motor-driven fan on the housing.

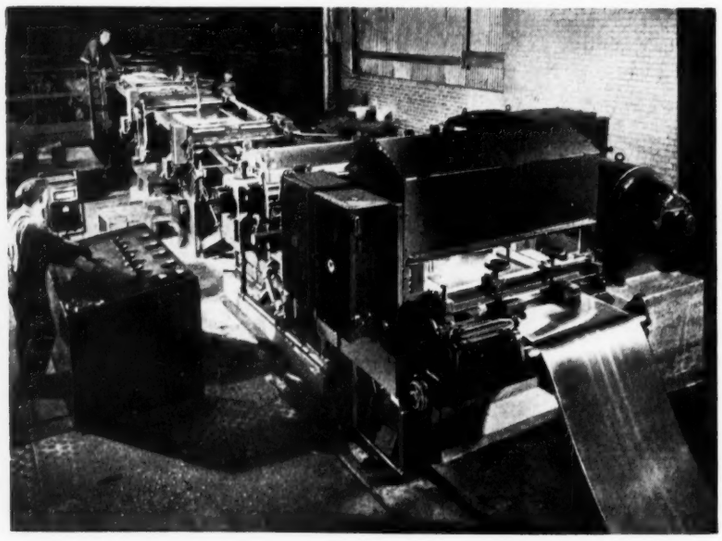


Exciter Lamp and Photo-cell Housings with Lamp Housing Open, and Photo-tubes and Mountings Removed from Housing. Both the Lamps and the Photo-cells are Resiliently Mounted to Minimize the Effects of Vibration

The heavy-duty welded photo-tube housing is dust-tight, and is mounted directly below the light source and below the moving strip. It contains a photo-tube for each lamp in the light source. The strip clears the housing usually by about 1/4 inch. Adjustable side guides provide a means of centering the strip in the detector and also of adjusting the unit for varying strip widths. The latest models have the light source and photo-tube housings hinged together at one end, permitting the light source housing to be swung up, out of the way, when the operator is threading the steel strip through the line.

The amplifier housing is suspended on springs underneath the photo-tube case, and the thyratron and any other miscellaneous control panels mounted at a convenient spot near or on the shear line.

The application of the pin-hole detector is not limited to steel strip alone, although, so far, that has been the only important use. Detectors of this sort have been very effective in operation. They are practically fool-proof, and once set for duty require very little maintenance other than periodical tube checking.



One of the First Pin-hole Detectors Installed and Operating on a Shearing Line in a Steel Plant. The Two Cabinets at the Left Contain the Thyratron Panel and a Panel for the Strip Marker Control

* * *

The Timken Roller Bearing Co. has just stepped up its electric furnace steel production to 360,000 tons per year through the installation of a new 65-ton electric furnace. This makes the seventh electric furnace in the company's steel plant. In addition to the electric furnace capacity, the steel plant has three 100-ton open-hearth furnaces, producing over 200,000 tons of steel a year.

Five Weeks Delay Averted by Cast Iron Welding

A COSTLY delay in the delivery of an urgently needed cast-iron vacuum-pan drier for installation in a Canadian explosives plant was recently averted through oxy-acetylene welding with cast-iron rod, according to The Linde Air Products Co. The job was notable for the size of the casting, which weighed 7100 pounds, and the extent of the repair. Careful preheating, efficient application of weld metal, and close teamwork among the operators effected a completely successful repair without distortion.

The trouble developed when a crack, 12 inches long, appeared, after machining, next to an opening in the 1 1/8-inch thick inner wall of the hollow jacket. In veeing out the crack as a preparation for welding, it was found that the crack was in the center of an approximately 8- by 12-inch area of unsound metal, all of which would have to be removed and replaced with cast-iron weld metal.

Several methods of repair were attempted without success. Even bronze-welding was not feasible, since the bronze weld metal would have been subject to the chemical attack of materials in the drier during service. A welding engineer, called in to supervise the repair, advised oxy-acetylene welding of the casting with a cast-iron rod after the part had been thoroughly preheated to avoid distortion during welding.

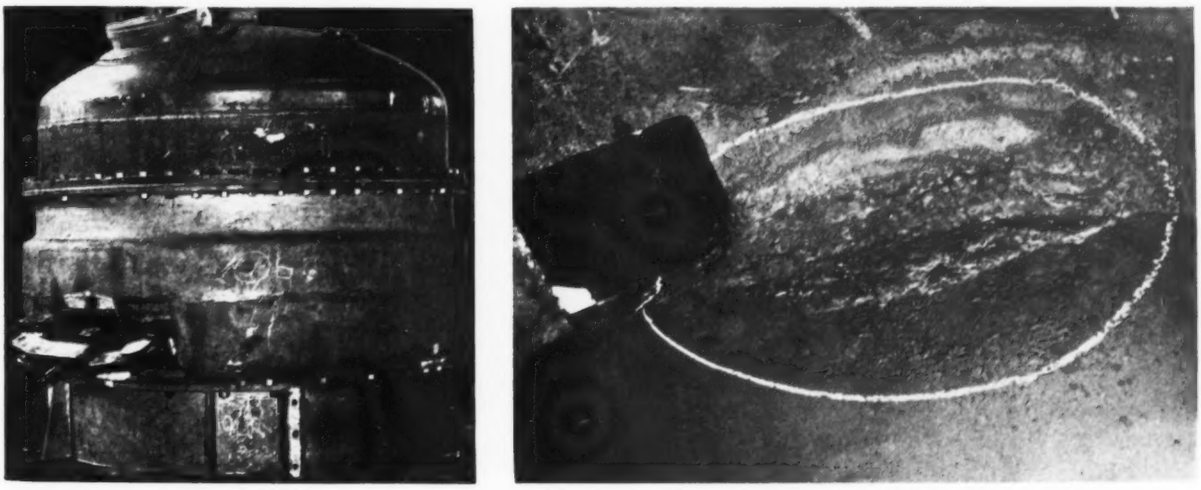
A temporary firebrick furnace was built around the casting and fired with charcoal. Heat was conserved by covering the furnace with a tent of asbestos paper through which holes had been punched for ventilation and for carrying away the fumes from the area where the welding operator would work. After the casting had been uniformly heated, welding operations were begun with a long-handled, heavy-duty welding blowpipe.

During the operation, three welders and one helper worked in relay to fill in the large breach with cast-iron rod, treated with flux. Due to the intense heat resulting from the preheat, an operator could work only from three to four minutes, standing inside the casting. When he was obliged to leave his position, the blowpipe was handed to the helper who kept the weld heated until another operator could resume welding. Since the welding was practically continuous and the casting was held at a high temperature, with time out for only one additional furnace heating, the repair was a comparatively rapid one. After the opening had been filled in, and the casting cooled, it was only necessary to grind the weld to a smooth finish. A careful check gave no indication of distortion.

* * *

Regulation Gone to Extreme

Every phase of railroad operation is dominated by the Government. Management, in many instances, has been made into a rubber stamp—its freedom of action is taken from it, and it is bound hand and foot by politically appointed officials. The inevitable result is to hamper and discourage progress. Too much regulation is worse than no regulation at all. Sooner or later, if we are to continue our much-vaunted American reputation for progress, the whole regulatory system must be overhauled, with a view to restricting the power of regulatory officials to matters that fall properly within their province—and to returning to management those powers which it must possess if it is to serve the country to the greatest possible extent.—*Palmer, Mass., Journal-Register*



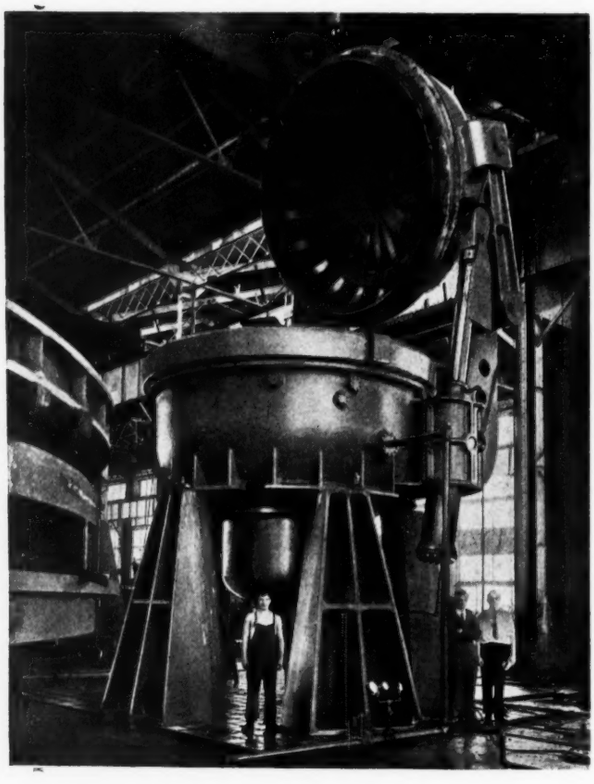
(Left) A Crack in the Jacket Inner Wall of This 7100-pound Vacuum-pan Drier Threatened Serious Delay in Its Delivery. A Large Surrounding Area of Unsound Metal Complicated the Repair Problem. (Right) Skillful Oxy-acetylene Welding with Cast-iron Rod Replaced the Unsound Metal, Restoring the Broken Section to Full Strength

Engineering News Flashes

Sheet-Steel Gage Measures Thickness when Applied to One Side of Sheet

A magnetic gage that, for the first time, measures the thickness of sheet steel when only one side is accessible, has been invented by W. E. Abbott and B. M. Smith of the General Electric Co., Schenectady, N. Y. This gage measures accurately to within 0.001 inch. The gage is portable, weighing only 7 pounds; in use, it is connected to an electric outlet. When the gage head is placed against the material to be measured, a permanent magnetic field saturates the material. The amount of magnetic flux that passes through the gage-head magnetic circuit depends on the thickness of the material. This thickness is indicated by the instrument reading, which is a measure of the increased reluctance of the magnetic circuit. The thickness of any magnetic sheet or plate material can be measured by the gage, provided the sheet is not backed by other magnetic material.

The present instruments measure sheets in thicknesses up to 0.045 inch, but gages can be made to measure thicknesses up to 1/4 inch with the same relative accuracy, if portability of the instrument is sacrificed, because the larger thicknesses require larger gage heads to supply magnetic saturation.



Giant Vulcanizer Capable of Curing Rubber Tires up to 10 Feet in Diameter, Built by the Baldwin Southwark Corporation, Philadelphia, Pa. This Machine Stands 18 Feet High with the Lid Closed, and 30 Feet with the Lid Open. The Inside Diameter is 12 1/2 Feet. It is Believed to be the Largest Machine of Its Type Ever Built. When Installed, Less than 8 Feet of the Press will Appear above the Floor

Recording Instruments Produce Records without Ink Lines

With a metal stylus and Teledeltos—an electrically conductive paper—recording instruments and similar apparatus can do their work without ink. The paper is discolored when brought in contact with an electric current which is passed through it by means of the stylus. With a sheet traveling an inch a second and a 110-volt direct or alternating current applied through a resistance of from 6000 to 10,000 ohms, the stylus makes a distinct line or mark. According to the *Compressed Air Magazine*, inkless recording has been practiced for a number of years by the Western Union Telegraph Co., which has recently placed the paper on the market. The conductive paper is available in both rolls and sheets.

Fluorescent Lighting Facilitates Sorting of Metal Scrap

Molybdenum, tantalum, stainless steel, and nickel scrap pieces are being identified and separated quickly and accurately at the Westinghouse Lamp Division, Bloomfield, N. J., by the characteristic color tinges that appear on these different metals under "daylight" fluorescent lighting. Sheet molybdenum and tantalum, especially, look alike under ordinary incandescent light and cannot be separated by visual inspection.

By segregating the scrap material into small piles and throwing the light of a single 24-inch daylight fluorescent lamp in a concentrating reflector upon them, the tantalum can be identified instantly by its apparent bluish hue, while molybdenum retains its characteristic metallic color. The method is so foolproof that these scrap materials are now sold with a purity guarantee, whereas formerly pieces of tantalum became mixed with the rest of the scrap. In one case where $700 worth of scrap material was involved, an additional $100 worth of tantalum was recovered through the use of fluorescent lighting.

Explosions Prevented by Non-Sparking Shoes for Mules

An interesting application of Ampco metal, made by Ampco Metal, Inc., Milwaukee, Wis., was recently called to our attention. In southern Illinois, the mules belonging to a well-known powder company are shod with shoes of non-sparking Ampco metal. Thus, the flying sparks which might be emitted from ordinary shoes are avoided, and explosions and fires from this source are practically eliminated. This alloy is also used for non-sparking safety tools, employed in operations where sparks might cause explosions and fires, as in coal mines, powder mills, and chemical plants.

New Method of Lubricating Bearings Operating at High Temperatures

A method of lubricating bearings operating at high temperatures has been developed and patented by the Acheson Colloids Corporation, Port Huron, Mich. It is designed to improve lubrication under conditions in which the oil or other vehicle is vaporized at the particular temperature of operation, as in ovens or furnaces, and to leave no residue or generate objectionable fumes.

The lubricant consists of from about 0.2 to 2 per cent by weight of "Dag" colloidal graphite, a non-flocculating graphite dispersed in a suitable volatile vehicle. The colloidal graphite penetrates wherever the volatile vehicle will penetrate and coats the metal bearing surfaces, even though but a small quantity of lubricant is used. Thus objectionable deposits are not formed even after a long period of time. Lubrication may be infrequent, and agitation of the composition is not necessary before application. Since the graphite does not flocculate, it will remain suspended in the vehicle for an indefinite period of time.

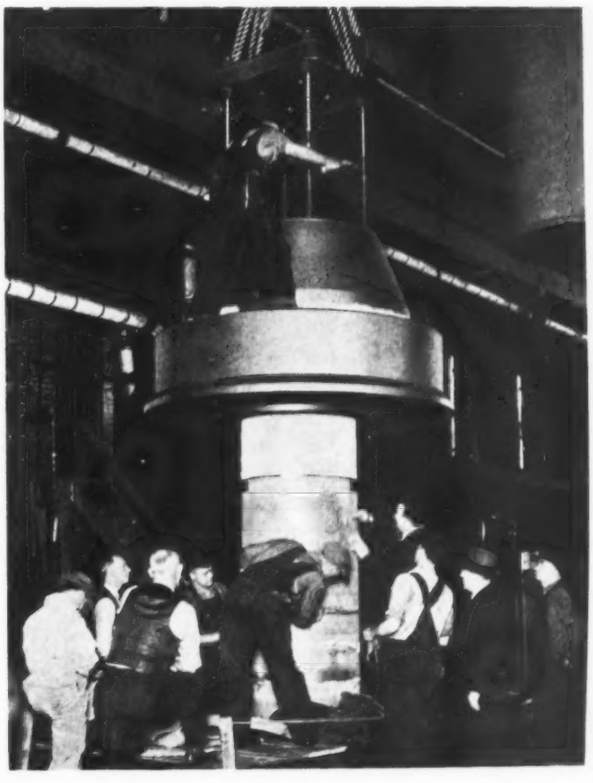
Although a dispersion of colloidal graphite in kerosene was mentioned in patents as early as 1908, and similar products have been used for many years as lubricants for furnace and oven equipment, suitable dispersions were not available until the recent development of non-flocculating colloidal graphite.

Mixtures containing flake graphite have a tendency to coagulate and deposit large quantities of graphite on surrounding high-temperature surfaces, often before the graphite reaches the bearing surface where lubrication is required. Another objection is that the flake graphite will remain in suspension only for a few minutes, so that it is difficult to assure a constant supply of the original quantities of graphite. The new development is intended to eliminate these difficulties, the patent relating especially to the non-flocculating feature, combined with the fact that only small quantities of the colloidal graphite are dispersed in light organic oils of various viscosities.

The lubricants so compounded with properly selected carriers may be fitted to the requirements of most ovens and furnaces, and, in all cases, accumulations of objectionable deposits are considerably reduced or completely eliminated.

Gamma Rays Used to Detect Flaws in Steel

Radium sulphate is now being used to make gamma-ray photographs of parts of steam turbines, propulsion gears, and auxiliary apparatus for the United States Navy at the Westinghouse Steam Division Works, Lester, Pa. This inspection process, worked out by cooperation between the Navy engineers and the Westinghouse research engineers, is being applied also to commercial power apparatus. When these photographs are made, flaws in the metal appear on the film as dark areas, because the rays are able to reach the film with greater intensity through flaws than through a solid metallic structure. The equipment is powerful enough to be used for examining steel 10 inches thick. The time of exposure varies from a few minutes to forty-eight hours.



Assembling One of the Three 30,000-K.V.A., 13,800-volt Generators Constructed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., for the Chickamauga Dam. The Illustration Shows the 8-foot Diameter Thrust Collar being Lowered on the Upper Part of the Generator Shaft after the Latter has been Shrunk by the Use of Dry Ice, Reducing the Outside Shaft Temperature to 23 Degrees F.

Wanted—A Bill of Rights for Those Who Create Employment

The Supreme Court decision in the Phelps Dodge case has called to public attention more than ever before the policy of our Government to give special privileges to certain groups — in this case, members of labor unions—in direct contradiction to the age-old principles of equal individual rights that have been recognized by the Anglo-Saxon world for centuries and that form the basis of democracy.

In the Phelps Dodge case, the Court, basing its decision on the Wagner Labor Act, ruled, in effect, that an employer cannot refuse to hire a man whom he does not deem suitable to work for him, if the applicant can make it appear that he was refused employment because of union membership. The Labor Board, in this case, not only directed that two men who had previously failed to get employment, be hired, but further ruled that they were entitled to back pay from the day when they had first applied for work. The Supreme Court decision upholding the Labor Board was handed down by a majority consisting of the judges appointed by President Roosevelt. A minority consisting of Chief Justice Hughes and Justice Stone dissented. The dissenting judges held that the Wagner Act does not authorize the Labor Board "to order an employer to hire applicants for work who have never been in his employ and to compel him to give them back pay."

Does Labor Board or Employer Decide Who Should be Hired?

No fair-minded man denies to any group of citizens the right to organize in associations or unions for the purpose of furthering the interests of the group by peaceful means; and that labor unions have served a useful purpose, no unbiased person would question. But this right to organize has, in recent years, been defined by law, and by the interpretation of the law by the courts, as something much more far-reaching than the mere right to organize and promote mutual interests by peaceful cooperative action. It has, in effect, been interpreted as *the right to deprive other citizens of their time-honored fundamental rights.*

The management of a manufacturing concern, in order to achieve success, must have the right to choose the correct materials for the product to be made, and to select the best methods and machinery for its manufacture. It might also be assumed that it would have the right to employ such men as seem best fitted to do the work and to promote the welfare of the business. But that right recent legislation denies. Under the Wagner Act, as interpreted by the Supreme Court, the manufacturer is not entitled to select the men who, in his judgment, are best suited to promote the efficiency and success of the enterprise. He is not to consider whether or not the hiring of a certain man may promote or obstruct the welfare of his business. He may be forced by law, according to this recent interpretation, to hire men that he believes to be detrimental to the business and consequently to the welfare of the other workers. That, in effect, the Supreme Court says is the law.

Law-Made Privileges for Groups Undermine Democratic Ideals

If this is the law, then it is high time that it be changed through the combined efforts of all groups of citizens who realize that the welfare of the nation is closely tied up with efficiency in the conduct of manufacturing enterprises.

Our national Constitution has a Bill of Rights covering the inherent rights of every man and woman; but what we need, in addition, is a Bill of Rights for the men who create employment—the men without whom, as the recent depression clearly emphasized, the great majority have proved themselves unable to earn a living. Now these men who are capable of creating employment—of organizing and planning work for people who are willing to work, but who are unable to do such planning for themselves — ought to have their rights recognized. Just as the worker has the legal right to refuse to work for an employer whom he does not want to work for, so the employer ought to have the right to say whom he wants to employ. But the law says "No."

Should There be One Law for Employers and One for Employes?

The rights of employes are now well defined by law; the rights of employers should be equally well defined. And one of the fundamentals that should be written into a Bill of Rights for those who create employment is that no employer can be forced by law to employ anyone who, in his judgment, will not promote the welfare of his business.

Ingenious Mechanical Movements

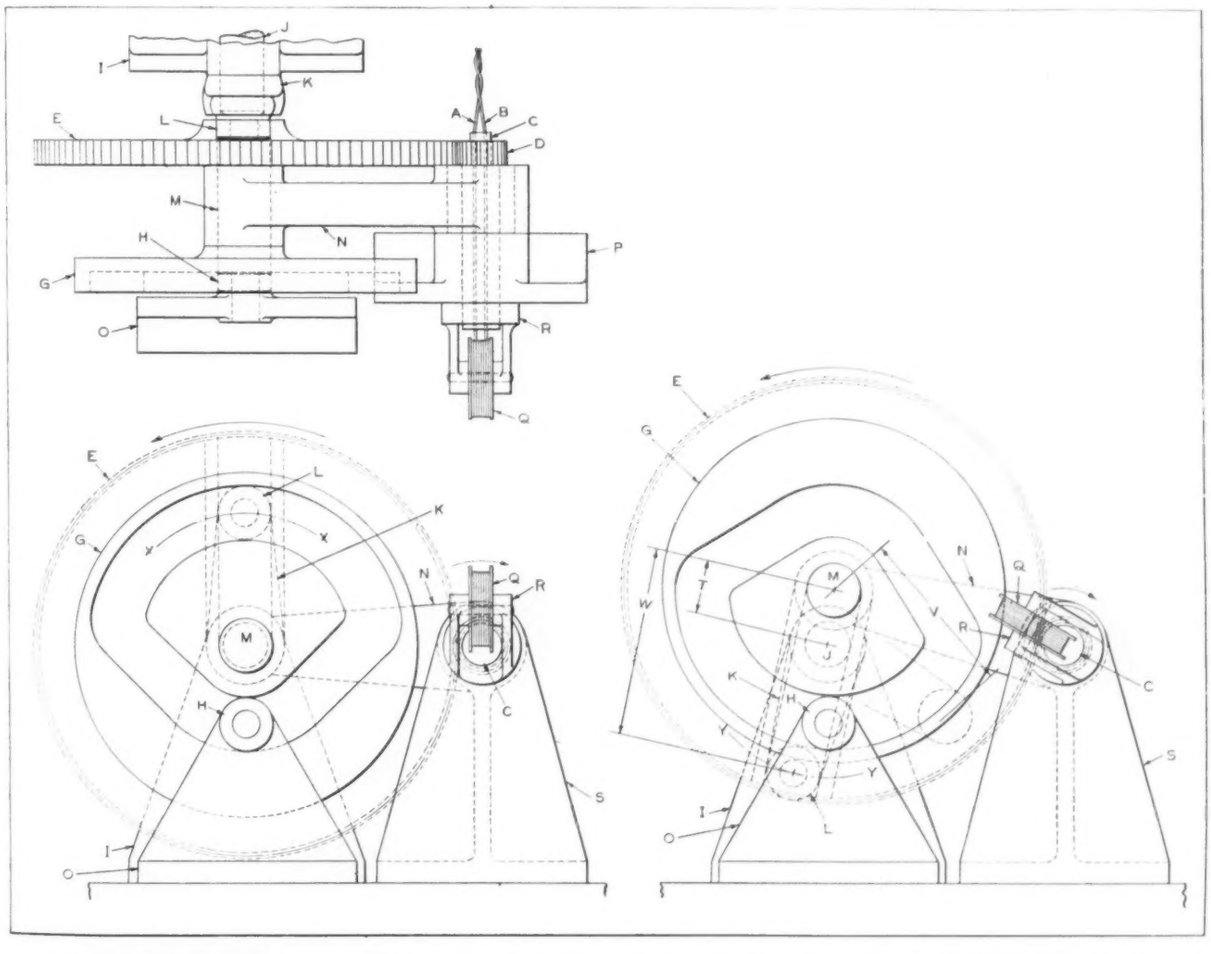
Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Wire-Twisting Mechanism Designed to Vary Pitch of Twist

By L. KASPER

The purpose of the mechanism here illustrated is to twist two lengths of wire *A* and *B* together, the pitch of the twist being varied to suit certain requirements. The two wires are fed at a uniform rate of speed through the twisting spindle *C*, the rotating speed of the spindle being automatically varied, so that a definite number of twists of uniform pitch are produced, followed by twists of constantly varying pitch. The wires twisted together in this manner are later cut to length. The three views in the illustration show the interesting mechanism which was designed to produce the required variations in the speed of rotation of the twisting spindle.

As shown in the illustration, the bearing *I* supports the driving shaft *J* from which the mechanism receives its motion. Lever *K* is keyed to shaft *J* and carries the roller *L* at its outer end. Gear *E* is keyed to shaft *M*, which is carried on one end of the lever *N*. The roller *L* fits in a groove of gear *E* and is used to transmit the rotary motion of shaft *J* to gear *E*. The internal cam *G* is keyed to the shaft *M*, and therefore rotates in unison with gear *E*.



Mechanism of Wire-twisting Machine Designed to Vary the Speed of Gear E and Spindle C by Employing a Cam to Offset the Axis of the Driving Shaft J and its Arm K with Respect to the Driven Shaft M

The roller *H*, carried on bracket *O*, travels in the groove in cam *G*. Lever *N* is supported freely on the hub of bearing *P* within which the spindle *C* rotates. Spindle *C* is provided with two holes through which the wires *A* and *B* pass, and receives its rotary motion from the gear *E* through the pinion *D*. The wire reel *Q* is carried on the hub *R*, which rotates with spindle *C*.

Referring to the views to the left in the illustration, the gear *E* is rotated in the direction indicated by the arrow, receiving its motion from shaft *J* through lever *K*. The spindle *C* is rotated in the direction indicated by the arrow, receiving its motion from gear *E* through pinion *D*, the ratio in this case being 8 to 1. The relative positions of shafts *J* and *M* are controlled by the position of the roller *H* in the groove in cam *G*.

In the position shown in the view in the upper left-hand corner, the axes of the shafts *J* and *M* coincide, and the arc of travel of roller *L*, indicated by the line *XX* in the lower view, is concentric with the axis of shaft *M*. Therefore, at this point, there is no movement of roller *L* in the groove on the back of gear *E* and the speed of rotation of gear *E* is uniform and at the same rate as that of shaft *J*. As the wires *A* and *B*, which are wound double on reel *Q*, are fed through spindle *C* at a uniform rate of speed, a twist of uniform pitch is formed as long as the roller *H* remains in the lower portion of the groove in cam *G*.

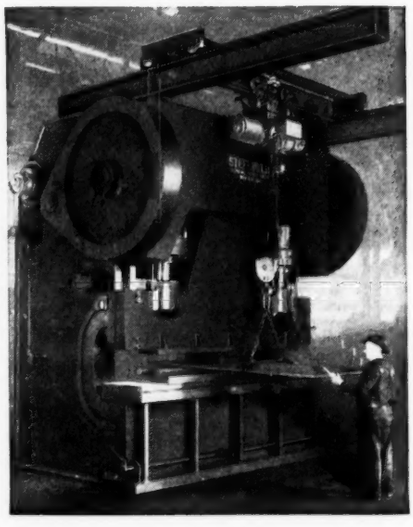
Referring to the view at the right, continued rotation of gear *E* has brought the high point of cam *G* into operation on roller *H*, causing cam *G* and gear *E* to be raised by the lever *N*, swiveling on bearing *S*. In this position, the axes of shafts *J* and *M* no longer coincide, being separated by the distance *T*. Owing to the change in the position of gear *E*, it will be noted that the path of roller *L* indicated by the line *YY* is now closer to the pitch line of gear *E* than shown in the view at the left.

The effect of this change is twofold. The peripheral speed at the pitch circle of gear *E*, when the gear is in the position shown in the view in the lower left-hand corner of the illustration, is greater than at the path followed by the roller *L*, in the ratio of the difference of their radii. In the view to the right, the path of roller *L* is closer to the pitch line of gear *E*, and although gear *E* and lever *K* are still rotating on the axes of their respective shafts, the change in the relative positions of the axes of shafts *J* and *M* produce the same effect at this point as would occur had the length of lever *K* been increased a corresponding amount.

As the speed of rotation of spindle *C* is governed by the peripheral speed of the pitch circle of gear *E*, spindle *C* is rotating at a lower rate of speed when in the position shown in the view at the right than when in the position shown at the left, the effect being to give a closer pitch twist to the wires *A* and *B*.

The second effect of separating the axes of shafts *J* and *M* is to produce a variable rotation of gear *E*. Regardless of the relative positions of the two axes, the effective length of the lever arm in transmitting motion from shaft *J* to shaft *M* is equivalent to the distance between the axes of these two shafts at any given point in the cycle, as indicated by the distance *W*. This distance will be greatest, and the rotation of gear *E* will be slowest, when the axes of shafts *M* and *J* and roller *L* are on the same straight line. As shown in the view at the right, this point has not quite been reached.

When this point is passed, the length of the lever arm is gradually reduced, as indicated by the dimension *V*. During this period, spindle *C* is being rotated at a variable speed, thereby producing a twist of varying pitch in the wires. When the lower portion of cam *G* is again brought into action on roller *H*, the axes of shafts *J* and *M* again coincide, and spindle *C* rotates at uniform speed.



The Steelweld Machinery Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, is Now Equipping Some of the Larger Bending Presses Built by the Company with Individual Overhead Traveling Cranes as Here Illustrated, Making it Easy for One Operator to Handle the Heavy Plates to be Operated upon. The Cranes are Fabricated by the Cleveland Tramrail Division of the Company, and are Mounted on the Top of the Machines, with the Crane Runways Extending Eight Feet in Front of the Press

What is Wrong with Machine Shop Training in Vocational Schools?

A Teacher, with Long Experience in Vocational School Work, Points out Some of the Most Serious Reasons for the Failure of Many Vocational Schools to Provide Proper Training

By SAMUEL GAHAN
Teacher of Machine Shop Practice
Murray Hill High School of Building and Metal Trades
New York City

AT the present moment properly conducted vocational schools, particularly those giving instruction in machine shop work, could be of inestimable value to the nation. How to make them of value is still a difficult problem, the solving of which is worthy of the efforts of our best educators, industrialists, and engineers.

In order to assist in solving this problem, the writer would like to suggest a method of attacking new problems used by a great engineer, H. A. Harvey. Though best known as the inventor of the Harvey process of hardening armor plate, his chief work was in the inventing and developing of methods of doing by automatic machinery what had previously been done by hand. In the course of his career, he solved hundreds of mechanical and scientific problems, each in such an original and ingenious manner that his work attracted wide attention.

On one occasion, he was asked to tell of his method of attacking problems. He was asked, particularly, if before starting on a new problem he sought information as to how other engineers had attempted to solve that problem. To this he replied that he never did. He said that he always solved the problem in his own way first and afterward looked up what others had done. He usually found that he had solved the problem in an entirely different manner from any of his contemporaries, and in many cases in a far better way. He said that if he had first looked up what others had done, he would most likely have fallen into a rut from which it would have been difficult to escape.

Now, the writer feels that if ever there was a time for the use of the Harvey method, it was when vocational education was introduced into the public schools. That it was not used, and is not being used, is obvious.

In order to fully understand the problem confronting us, a brief review of the development of vocational training is desirable. Training of the hands in the use of tools is not new in school work. Manual training was introduced more than seventy-five years ago. Whatever was the purpose of its introducers—and that is a disputed point—we all know that the schoolmaster soon seized upon the idea, made it conform to his previously conceived ideas, and used it as an aid to academic teaching. Little attempt was made to teach the methods of industry, and teachers without previous shop experience were trained for this work in teacher-training schools. Thus, the training was of little value to boys who had to go to work upon leaving school. Some thirty years ago, a strong movement in favor of real vocational training developed. The National Society for the Promotion of Industrial Education was formed, and many Boards of Education were induced to start pre-vocational and vocational courses.

Vocational education is quite different from manual training. Its purpose is to fit the pupil for useful employment in some specific trade or occupation. Vocational education must concern itself with the preparation of youth for immediate self-support. Shop teachers are taken from the industries. They are men and women who have previously earned their living working at the trade they are teaching. Unfortunately, this requirement does not apply to the supervisors; consequently, if we are not on the alert, our vocational education may follow the same pattern as manual training.

The Need for Practical Guidance in Vocational Education

A great impetus was given to vocational education by the passage of the Smith-Hughes Act in 1917. This Act appropriated large sums for vocational teachers' salaries and also for training shop men as teachers. The Federal Board for Vocational Training was created and charged with the general administration of the Act. In the opinion of the writer, the great mistake of the Federal and State Boards of Education was in allowing so much of the

administration of this new type of education to fall into the hands of the old-line academic educators.

This is said without any lack of respect for academic teachers. They are doing fine work in their own field, but their training and experience have not been such as to prepare them for the handling of radically different problems. While they have introduced many admirable innovations in academic teaching, none of those is comparable with the radical changes necessary for effective work in the vocational field. On the other hand, engineers and industrial managers have many diversified problems continually presented to them, problems that are often solved by revolutionary changes in manufacturing methods. Because of this training, these men should have been selected to tackle the problem of introducing machine shop training in the public schools, or at least to advise on such work.

How the Machinist's Trade Should be Taught in a School

Machine shop teachers would have a great advantage over other vocational teachers in demonstrating the possibilities of vocational training if they were given an opportunity to do their work under conditions similar to those in industry. Since the machinist makes machinery and tools, vocational school students are able to do much of the repair and maintenance work of the school shop and also to make additional small and special tool equipment.

In the school with which the writer is connected, tap wrenches, hardened and ground lathe centers, milling cutters of various types (including helical and angular cutters and end-mills), reamers, and mandrels are made. The more advanced students are given opportunities to design and make special tools and equipment, such as gages, jigs, fixtures for grinding Acme-thread tools, special tools for the milling machine, planer, cutter grinder, and turret lathe, etc.

These examples merely serve to indicate the unlimited field of practical work that can be taught in a vocational school under proper conditions. By doing this useful work, the student is made to feel that he is playing a real part in the maintenance of the school, and thus his interest in his work is stimulated to a higher degree than would be possible were he kept busy on mere "exercises."

Unfortunately, however, many vocational schools seem to have no clear-cut objective and no thorough course of study. We often find such exercise projects as a toy anvil, a door hasp, a candlestick, a paper knife, a pancake turner, a tack hammer, a twisted scriber, etc., prominently displayed as students' work. The result of this is that vocational school work, except in a few instances, is not highly regarded by industrial managers. One manager said, on a certain occasion, that he wished the public school people would keep their hands off shop work, and pay more attention to their own work of teaching academic subjects; and another said that boys from vocational schools had to "unlearn" so much that their school training hampered rather than helped them. The writer knows from experience that there is some ground for these opinions, but he places the blame for this condition on the school authorities rather than on the vocational school teachers.

Why Vocational Schools Must Differ from Those Teaching Academic Subjects

If the vocational schools are to make a success of industrial education, the school authorities must have a clear understanding of what the schools should teach, and also of the difference between the methods of teaching applicable to the classroom and to the shop.

In the classroom, the students are usually seated in front of the teacher, all doing pretty much the same kind of work. They are always under the watchful eye of the teacher, and even the most mischievous boy can cause but little trouble before being observed.

In the machine shop, the conditions are entirely different. The pupils are scattered over a large room, some working on expensive and dangerous machinery, all working on individual jobs, and each requiring considerable individual attention. When the teacher is helping one boy, he may have to turn his back to the rest. This necessitates an entirely different kind of discipline—the kind that teaches a boy to do the right thing when he knows that he is not being watched. This is the kind of discipline that will help him later in life, and is the kind the world needs.

There is little similarity to classroom teaching, yet to some school authorities a class is a class, and often a class of forty or more is sent into a machine shop filled with dangerous machinery. What is the teacher to do? He may, for a short time, ape the academic teacher and lecture to the class, but a mischievous boy can size up the situation immediately. Men in the trade who are prone to condemn the school shop teacher without a clear understanding of his tribulations should consider what they would do under the same circumstances. Would you complain to the principal? Well, there are many types of principals; perhaps you would receive sympathy, perhaps not. But, undoubtedly, you would be told that you were being given "an excellent opportunity to demonstrate your ability as a disciplinarian, and that is what really counts in school work."

Selecting the Right Kind of Supervisors for Vocational Schools

In our great manufacturing plants, superintendents and general foremen are invariably selected from those who have had machine shop training. Only men who have been trained in accurate work and in manufacturing methods are considered qual-

ified to supervise such work; but in our vocational schools the method of selecting men for supervisory positions is quite different. In New York City, for instance, the teacher's immediate supervisor, the "first assistant" or "head of department" is selected by competitive examination.

Now, in theory, this method is excellent, but in practice it does not always produce the best result. The examiner's training and experience is usually wholly academic, and because of this he may be inclined to give more weight to the manner in which a candidate gives a "lesson" in a classroom on, say, "how to read a micrometer caliper" than to the manner in which he teaches the boys in the shop how to *use* the micrometer for the production of accurate work. Of course, if the candidate should hold a college degree, particularly a doctor's degree, that would be considered of more importance than any number of years experience in the industry. The methods used by the examiners often deter the best shop teachers from taking an examination.

At present, there are relatively few regularly appointed heads of department in vocational subjects; consequently, if the principal needs an assistant he may group together, as a metal trades department, such shops as those teaching machine shop practice, plumbing, automobile repairing, and sheet metal work, and appoint any teacher he likes to act as head of this department. Thus, plumbing shop teachers and automobile repair shop teachers—without the slightest knowledge of machine shop practice—have at times been selected to supervise machine shop work. At the present time, such an assignment carries with it no increased compensation, but it does give the temporarily appointed supervisor an advantage when he takes an examination for regular head of department.

Some people may say that unwise selection of supervisors and favoritism exists and always will exist in every industry and in every walk of life. That may be true, but it does not produce such disastrous consequences as is possible in the vocational school system. For example, if the superintendent of a large department in a manufacturing plant should acquire the reputation of being unfair, his best men would leave at the first opportunity, and those who would remain would have little heart in their work, with the result that production would rapidly decline in quality or in quantity. Now, as the value of a commercial product can be measured in dollars and cents, the offending executive would promptly be hauled over the coals. Thus, in industry, there is an effective check on the abuse of authority.

Unfortunately, there is no direct or accurate measure for the product of the vocational school. No criteria or standards; no effective examinations; no check-up; no responsibility placed squarely on the shoulders of the principal. A principal with ability to convince his immediate superior, the academic district superintendent—sometimes a woman—of his fitness, may run his school pretty much as he pleases.

When a pupil in, say, his third year in an academic high school changes to a vocational high school, he is given full credit for his time in the academic school and may graduate the following year, though he will have had only about one year of shop training. Yet he is awarded the same diploma as the boy who has had full four years' training. The diploma attests that he has completed the full vocational course. This practice tends to make a joke of vocational training and is responsible, to a great degree, for the difficulty vocational school graduates have in finding jobs in which they can complete their trade training.

What Can be Done to Make Vocational Schools Truly Useful?

Is a complete divorce between the academic and the vocational branches of our educational system necessary or desirable? There is so much to be said on both sides of this question that the writer hesitates to bring up the matter, but it is a subject that is being discussed more and more. After a quarter of a century's experience in vocational schools, the writer is convinced that little can be accomplished with the present set-up, yet he feels that, with a complete divorce, non-educators, manufacturers, and others might dominate the vocational schools to such an extent that the cultural side of education would be wholly neglected, just as the academic educators have neglected the vocational side. Those concerned—industrial leaders, progressive labor organizations, and educational authorities—should investigate, from their respective viewpoints, the vocational school systems of the country and try to bring about the much needed reforms. If a divorce is required for the time being, let us hope that later on there will be a reconciliation, and that then both sides will work harmoniously for a better vocational system.

What we want is men of the Harvey type of mind at the head of the educational system, men who can put their school-acquired ideas on the shelf for the time being and approach this big problem with an open mind, dissect it, analyze it, and bring forth a logical solution, no matter how radical it may seem. Such a solution may have to be modified to suit existing conditions, but with a true objective in mind we will make far better progress than if we insist on making vocational education fit into the conventional academic channel.

* * *

Summer Meeting of Automotive Engineers

The summer meeting of the Society of Automotive Engineers will be held at the Greenbrier Hotel, White Sulphur Springs, W. Va., June 1 to 6. Sessions will be held on aircraft engines, Diesel engines, fuels and lubricants, passenger car design, trucks and buses, transportation and maintenance, and national defense.

Important Factors in Electric Motor Maintenance

Checking and Correcting Faults in Motor Lubrication Systems, Bearings, Insulation, and Current Collecting Devices on a Regular Maintenance Schedule

By W. W. McCULLOUGH, Service Department
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

MODERN maintenance of electric motors involves periodic and systematic inspection by trained and competent men. When efficiently conducted, such inspection can be made the basis for considerable savings, which will accrue from the elimination of losses in operating time due to unexpected breakdowns and the reduction of excessive expenditures caused by repairs long overdue.

To accomplish this, however, all points at which trouble is likely to occur must be checked and new ones constantly sought out, careful records must be maintained, and a regular inspection schedule must be faithfully adhered to. Such a schedule must, necessarily, be elastic and adapted to the needs of each plant. It is, therefore, impossible to give any hard and fast rules for the frequency of inspection, although the following suggestions, which are based on average conditions in so far as duty and dirt are concerned, may be helpful:

Once a week check oil level, free movement of oil-rings, and temperature.

Once a month check brushes, brush-holders, and shunts, and blow out motor with air.

Once a year check air gap with feeler gage; check insulation resistance with megger; check line voltage with voltmeter; check load with ammeter; and check renewal parts stock in the light of the past year's experience.

Every two years dismantle, clean and varnish windings; see that all windings are tight; and replace loose wedges and bands.

After the initial inspection comes the establishment of a record system, which may be tailor-made to fit the job, or one of several excellent systems, which have been reduced to forms and cards that are readily obtainable, may be installed. Usually a form of recording detailed motor and parts information, as well as a form for recording periodic tests of insulation resistance and temperature, are utilized. Air-gap measurements of important motors should also be recorded.

Rationalized maintenance means more than repairing breakdowns. It may call for the complete replacement of obsolete units; or it may call for the installation of thermostatic switches to protect motors from destructive overloads. The list can be extended. If a sleeve bearing requires oil more than three or four times a year, consider its replacement with a sealed sleeve type bracket and bearing. If vibration has caused trouble, consider dynamic balance. The expense of dynamic balance is justified if customary static balance does not make a motor run without harmful vibration.

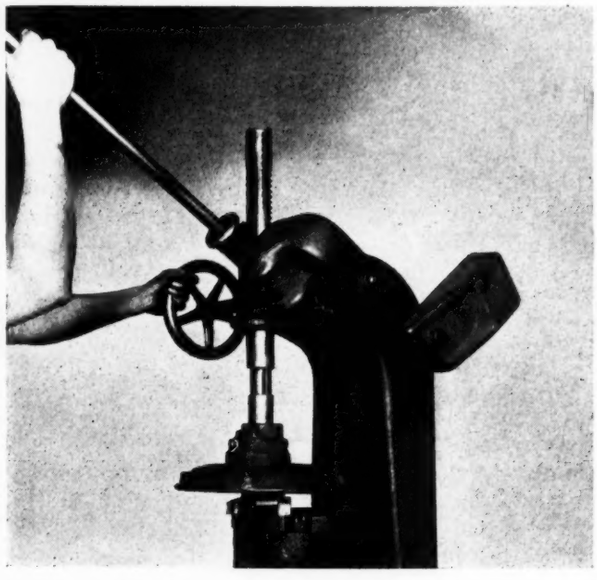


Fig. 1. Recommended Method of Pressing a Sleeve-bearing Shell out of or into a Motor Bracket

We will first consider all motors, whether direct current, single-phase alternating current or polyphase alternating current, as rotating electrical equipment, depending upon a mechanical assembly for the transformation of electrical energy into work. Before the electrical part

of this transformation system can function, it is absolutely essential that the mechanical links in the chain are in proper operating condition. As an example of the importance of these mechanical factors, an analysis of induction motor failures shows that bearings are the principal offenders. Owing to the small amount of air gap in induction motors, the failure of a bearing usually results in the rotor rubbing the stator.

Maintenance of Lubrication

Item number one on the maintenance man's list is "lubrication." We are assuming, in the following discussion, that the bearings are correctly designed, have adequate area for the load, proper oil-grooving, working oil-rings, and suitable materials. In other words, the bearing must be so designed and built as to sustain the essential oil film which prevents metal-to-metal contact between the shaft and the bearing surfaces.

A safe temperature rise for a bearing under normal operating conditions is considered to be 40 degrees C. above the surrounding room air. At this temperature, a bearing feels only comfortably warm to the hand. If a bearing runs warmer than this, check the following points:

1. There may be insufficient lubricant or the grade may be incorrect. Dirt may be present, causing friction and wear. The oil-ring may be operating improperly. Check the grade of oil you are using with your oil supplier; he is in a position to give proper advice.

2. The mechanical parts may be improperly aligned. The shaft deflection may be excessive. This is one of the most serious effects of overloading. When under load, the shaft, in passing through the bearing, is slightly curved instead of being straight. If this curvature is slight, it can be taken care of by varying thickness of the oil film; if excessive, however, bearing failure will result.

Inspection of Bearings

In a sleeve bearing, the oil sticks to the shaft and is dragged along by the rotation of the shaft so as to form a wedge-shaped film between the shaft and the bearing. This film of oil measures from 0.001 to 0.003 inch thick, carries the load, and prevents metal-to-metal contact. Proper maintenance keeps the oil well filled to the correct level and the oil-rings turning. Oil should be added only when the motor is at rest. It may be said here that oiling of bearings is more often over done than under done.

The purpose of the felt washer is frequently misunderstood. It is used to seal the bearing housing against air currents, which pick up oil from the bearing, where it is wanted, and deposit it on the motor windings, where it is not wanted. The maintenance man must see that these seals are kept in good condition. As soon as bearing wear occurs, the effectiveness of the felt seals is spoiled by wear due to radial movement of the shaft.

New felts should be ordered from the manufacturer of the motor. If you have to make them in an emergency, use high-grade felt not less than 1/4 inch thick before compression. Make the inside diameter of the washer the same as the diameter of the shaft, or slightly less. Cut the felt true, with edges at right angles to the surface of the felt.

Worn bearings are most easily detected by a comparison of the air-gap measurements taken at the scheduled maintenance periods. The accompanying table gives standard bearing clearances.

In a sleeve bearing, as just explained, the shaft,

Allowable Limits for Bores of Horizontal Bearings

(All Dimensions in Inches)

Nominal Bearing Bore	Oil Lubrication		Grease Lubrication
	Babbitt Bearings	Bronze Bearings	Babbitt and Bronze Bearings
3/4 to 1	+ 0.0015 to + 0.0025	+ 0.0015 to + 0.0025	
Above 1 to 1 1/4	+ 0.003 to + 0.004	+ 0.003 to + 0.004	
Above 1 1/4 to 2	+ 0.0035 to + 0.005	+ 0.0035 to + 0.005	+ 0.005 to + 0.007
Above 2 to 2 1/2	+ 0.004 to + 0.006	+ 0.004 to + 0.006	+ 0.006 to + 0.008
Above 2 1/2 to 3	+ 0.005 to + 0.007	+ 0.006 to + 0.008	+ 0.008 to + 0.010
Above 3 to 4	+ 0.006 to + 0.008	+ 0.007 to + 0.009	+ 0.010 to + 0.012
Above 4 to 5	+ 0.007 to + 0.009	+ 0.008 to + 0.010	+ 0.012 to + 0.014
Above 5 to 6	+ 0.008 to + 0.010	+ 0.009 to + 0.011	+ 0.014 to + 0.016
Above 6 to 7	+ 0.009 to + 0.011	+ 0.010 to + 0.012	+ 0.016 to + 0.018
Above 7 to 8	+ 0.010 to + 0.012		
Above 8 to 9	+ 0.011 to + 0.013		
Above 9 to 11	+ 0.012 to + 0.014		
Above 11 to 13	+ 0.013 to + 0.015		
Above 13 to 15	+ 0.014 to + 0.016		
Above 15 to 17	+ 0.015 to + 0.017		
Above 17 to 19	+ 0.015 to + 0.018		
Above 19 to 22	+ 0.016 to + 0.019		
Above 22 to 28	+ 0.018 to + 0.021		

when in motion, is separated from the bearing and its housing by the oil film. In a ball bearing, a series of steel balls acts as the separating medium both when the motor is stationary—this accounts for the low starting friction—and when it is running. Ball bearings have increased in importance with the use of totally enclosed and fan-cooled motors.

To keep the steel balls uniformly distributed around the bearing, a cage or retainer is used, each ball having its own pocket. The balls have rolling contact with the raceways, but sliding contact with the surfaces of the retainer. Lubrication is, therefore, necessary. Most ball bearings are grease-lubricated, although oil is used in some cases. Follow the advice of your oil company in selecting a suitable grease. Carelessness in allowing containers to remain open often causes trouble from abrasive dirt. Soda-base soap greases are usually preferred on account of their higher melting point and stability. They mix readily with water, however, and tend to form an emulsion.

Ball bearings in distress can usually be detected by undue heating or by unusual noise. Either sign calls for prompt action. A rise of 40 degrees C. is generally considered a safe operating temperature. If this is exceeded, look for an over-filled bearing. The chief danger from over-filling a grease-lubricated ball bearing is deterioration or breakdown of the grease due to the churning. The general rule is that the bearing housing should not be more than half full of grease. Most ball bearings are over-filled. Broken or nicked balls cause rapid destruction of a bearing. Listen for possible "clicks."

About every two years it is considered good practice to clean out the old grease and supply new. This assumes "average" service. After dismantling, the bearing should be carefully wrapped in clean cloth or paper to protect it from contamination. Remove all old grease from the housing. Clean the old bearing in Stoddard solvent. This is a very difficult operation, because particles of grit are not soluble and generally remain to cause further trouble. The container for fresh grease must be carefully protected from grit and dirt. Keep the cover on tight. Use a clean, non-metallic paddle for applying the fresh grease.

The air gap in a motor is dependent, first, on proper maintenance of the bearings, and, second, on correct alignment of the brackets or pedestals with the frames. These factors are of particular importance in the case of induction motors, as they operate with less gap than direct-current motors. Check air gap with a feeler gage at established scheduled periods. Make these checks at the pulley end, taking about four readings 90 degrees apart. For motors below 10 H.P., a minimum clearance of 0.005 inch should be maintained; above 10 H.P., the minimum gap should be 0.010 inch.

Testing, Cleaning, and Drying Insulation

The electrical conductors in a motor are separated from the magnetic circuit and from the mechanical assembly by materials generally grouped under the term "insulation." (In addition, insulation is also used in commutators to separate the bars from each other and in coils to isolate the individual turns.) We have said that the mechanical assembly must be right before the transformation of electric energy into work can take place. Insulation is the next fundamental. The insulation must be maintained, so as to function as an effective separator.

Research men have just about combed the earth for suitable insulating materials. Natural elements and synthetic materials in great variety have been used. Most of those used in industrial motors come under the following American Standards Association classes:

Class A—Organic materials, such as cotton, paper, and silk, when impregnated or immersed in oil; 105 degrees C. is the limiting "hottest spot" temperature.

Class B—Inorganic materials, such as mica, asbestos, and glass, combined with binding substances; 125 degrees C. is the limiting "hottest spot" temperature.

From a maintenance standpoint, remember that electrical insulation materials are non-conductors only when clean and dry. Motors subjected to excessively dirty, humid, or corrosive conditions will require constant care by the inspector. The best answer to the dirt problem is to clean the motor often enough to prevent accumulation. Clean, dip, and bake windings as soon as the varnish surface shows signs of attack from corrosive gases. Megger tests will give warning of dampness penetrating coil insulation.

Most coil failures can be traced either to bearing failures (causing the rotor to rub against the stator) or to movement of the coils. The inspector can guard against the first difficulty by careful check of the air gap.

Coil movement causes checking or

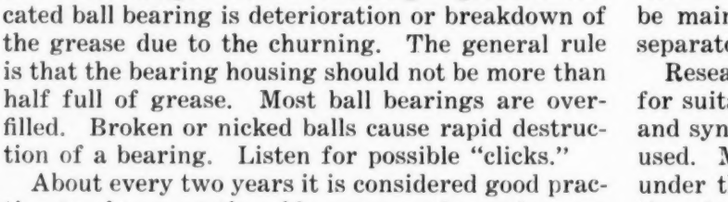


Fig. 2. Curve Showing Variation of Insulation Resistance with Drying Time and Temperature

cracking of the varnish on the surface of the coil, and the inspector should look for these cracks as signs of approaching insulation breakdown.

The most common method of removing dirt is to blow it out with compressed air. The pressure should not exceed 50 pounds to the square inch by gage. Before blowing out the motor, open the air valve until condensation has been carried away. Dirt blown out of a motor should be swept up and removed before it is picked up by ventilating air and returned to the old location. Sometimes a heavy-duty vacuum cleaner can be used to advantage for picking up dirt, but its use for removing dirt from a motor is limited.

Some dirt sticks so tightly that solvents are required to remove it. If a motor has been flooded, so that the windings are full of mud, water is probably the first thing to use, although this means drying later. Cold water at about 25 pounds gage pressure should serve, unless heavy grease or oil is mixed with the mud. If this is the case, hot water or hot water and tri-sodium phosphate, for example, can be used to advantage. A steam "jenny" can be used for heating the water and adding the chemical. The water should not reach the boiling point.

Petroleum distillates are useful for removing accumulated grease and dirt, but the fire hazard must be kept in mind. Stoddard solvent, produced by the major oil refiners—commonly called "cleaners' naphtha"—with a minimum flash point of 100 degrees F., should be specified. Observe all safety requirements.

Carbon tetrachloride is non-explosive, and it has a pronounced affinity for oil and grease. The latter property makes it valuable for cleaning motors, but dangerous for the operator. When inhaled, the vapor has the same affinity for the protective oils in the respiratory tract as the liquid has for oil on motor windings. For this reason, a gas mask provided with a tube bringing in outside air for breathing should be worn by the operator. Remember that the fumes are heavier than air. Carbon tetrachloride is corrosive, and all traces should be removed from coils and insulation after cleaning. Use Stoddard solvent for this. A mixture of 50 per cent carbon tetrachloride and 50 per cent Stoddard solvent is considered non-inflammable, but should be treated with respect.

It is possible to damage the insulation on coils when drying, and, accordingly, the procedure should be carefully supervised. First, make sure that the total temperature will not roast out the insulation, and, second, that the heat is not applied rapidly enough to form steam under the surface of the insulation.

Oven drying with electric or steam heat is probably most satisfactory for drying out the smaller sizes of motors. If a homemade oven is used, suitable temperature control should be maintained to prevent roasting the insulation. The temperature of the oven should be governed by the class of insulation used in the motor. As has been pointed out in a previous paragraph, 105 degrees C. is the limiting "hottest spot" temperature for Class A materials, and 125 degrees C. the corresponding figure for Class B materials. A good rule to follow is to hold the oven temperature to one of these figures; 115 degrees C. is given as a maximum oven temperature in some dry-out instructions.

In drying direct-current or single-phase armatures, check the commutator. If it is full of water, it will probably be necessary to open it up for draining before the drying out can be accomplished. To do this, first put a temporary band around the bars to hold them in place, then remove the front V-ring, so that the trapped water can run out. After drying out, replace the vee, heat, and tighten the commutator. Finish up by turning (or grinding) and polishing.

An ohmmeter or a megger (500-volt type) is generally used for measuring insulation resistance to determine whether moisture, dirt, or other factors have produced any deleterious effect. It is usually agreed that the insulation resistance should measure one megohm per thousand volts operating voltage, with a minimum of one megohm. The readings taken, however, are valuable only from comparative standpoints; thus, readings of insulation resistance vary greatly with temperature, as shown by the curves in Fig. 2.

Checking Current Collecting Devices

Commutators for direct-current motors and single-phase alternating-current motors, and collectors for alternating-current motors require careful inspection. First of all, brush rigging should be checked. Most brush-holders in use are of the box type, and the holder should be replaced when worn. The brushes themselves must fit properly, not so tightly as to stick and not so loosely as to shift position when running. Make sure the grade used is right for the application. The best advice on brushes can be obtained from the manufacturer of the motor. The spring tension on the brushes should be uniform, so as to prevent selective action which will result in uneven brush wear. The actual pressure will vary with the design. Follow the maker's recommendation. On direct-current motors, stagger the brushes in pairs of arms to prevent grooving of the commutator.

The commutator has to be tight, and the surface has to be concentric for satisfactory operation. Tap with a hammer to check tightness of bars, and use a dial indicator to make sure that the surface is concentric. Turning, grinding, polishing, and under-cutting are operations best done in a good repair shop. This is true also for collectors that require turning and polishing.

* * *

Machine tool shipments in March were valued at $57,400,000. This is at an annual rate of approximately $690,000,000.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

When Does Machinery Become Legal Property of Owner of Building?

F. J. S.—In a case where heavy machinery has been bought on what might be called a part-payment plan, and the buyer of machinery finds himself unable to fulfill the contract, can the owner of the building in which the machine is installed prevent the seller from repossessing and removing the machine from the building?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

If the machinery is a "legal" fixture, it cannot be removed, because it automatically becomes the legal property of the owner of the building in which it is installed. A legal fixture may be anything, which, on being physically affixed in position, is considered under the law as having become part and parcel of the real estate. The intent, as indicated by the circumstances, to incorporate the object permanently with the real property has come to be the cardinal rule by which to determine whether such equipment is a legal fixture or not.

As an example, in Wedge v. Butler [6 Atl. (2d) 46], reported June, 1939, a seller had sold and delivered a planer. The purchaser executed to the seller, as security for the payment of the purchase money, a chattel mortgage on the property bought. The machine was bolted to the factory floor, connected to auxiliary equipment, and by means of belts, shafting, and pulleys, became part of the factory. The Court held that the planer was a legal fixture, stating: "The referee found, as a matter of fact, that the planer, on being set up, lost its character as a chattel, and merged, as a fixture, with the realty."

Castings for Hammer Mills

C. A. C.—What composition is considered most satisfactory for cast-steel hammers used in a hammer mill employed in grinding an abrasive clay?

Answered by Editor, "Nickel Steel Topics"
International Nickel Co., Inc., New York City

The problem of finding a material that will perform satisfactorily in hammer mills is one of the most difficult that we have experienced. It appears that conditions in each mill differ, and that material which performs satisfactorily in one hammer stands up very poorly in others.

On the whole, austenitic manganese steel has been the most satisfactory material that has been employed, but there have been many instances where the pearlitic steels have done a much better job. In this particular case, it is probable that the impact is not sufficient to work-harden the surface of manganese steel, and in that event, a heat-treated low-alloy steel should provide better abrasion resistance.

A steel that has performed very well in somewhat similar applications is a nickel-chromium-molybdenum steel of the following composition: Carbon, 0.40 to 0.50 per cent; manganese, 0.60 to 0.90 per cent; nickel, 2.25 to 2.75 per cent; chromium, 0.75 to 1.00 per cent; and molybdenum, 0.25 to 0.35 per cent.

The recommended treatment is as follows: Heat to 1750 degrees F., hold 2 hours per inch of section, and air-cool. Reheat to 1575 degrees F., hold 1 hour per inch of section, and quench in oil. Draw to a Brinell hardness of approximately 450 (which in this case, we believe, will involve a temperature of approximately 900 degrees F.).

While this steel has a higher carbon content than is usual in the low-alloy constructional type of steel castings, it has been our experience that it is necessary to have a comparatively high carbon content to secure good wear resisting qualities. Even higher carbon could be employed to advantage, say up to a maximum of 0.60 per cent, provided the impact stresses are not severe.

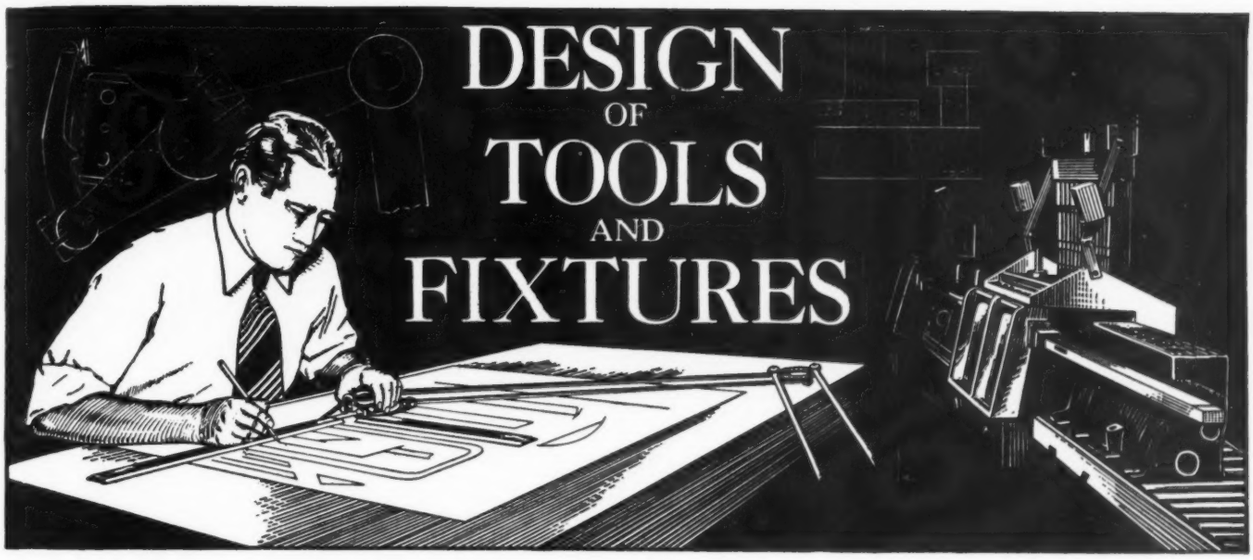
* * *

Increase in Use of Carbide Tools

As an indication of the tremendous increase in the use of carbide tools for machining steel, the Carboloy Company, Inc., Detroit, Mich., states that during the first quarter of 1941 there was an increase of over 450 per cent in the production of tantalum-titanium carbides used for machining steel, as compared with the same period last year. Compared with the first quarter of 1939, the use of Carboloy steel cutting tool materials is now almost thirteen times what it was then.

* * *

"Skill," in present-day machine shop practice, is not so much manual dexterity as it is knowledge of "how to do it."



Dies with Expansion Punches for Forming U-Shaped Frames from Channel Stock

By C. W. HINMAN, Chicago, Ill.

When employing a punch press for bending and forming deep or long U-shaped frames from channel stock, a forming punch is used that expands and collapses automatically. This feature is necessary because the die space and crank stroke of the average punch press are insufficient to permit the work to be stripped from the punch by conventional methods after it has been formed to a U-shape, as indicated by the dot-and-dash lines at *A*, Fig. 1.

The punch shown in Fig. 1 will collapse to a width *B*, Fig. 2, clearing the minimum space *C* be-

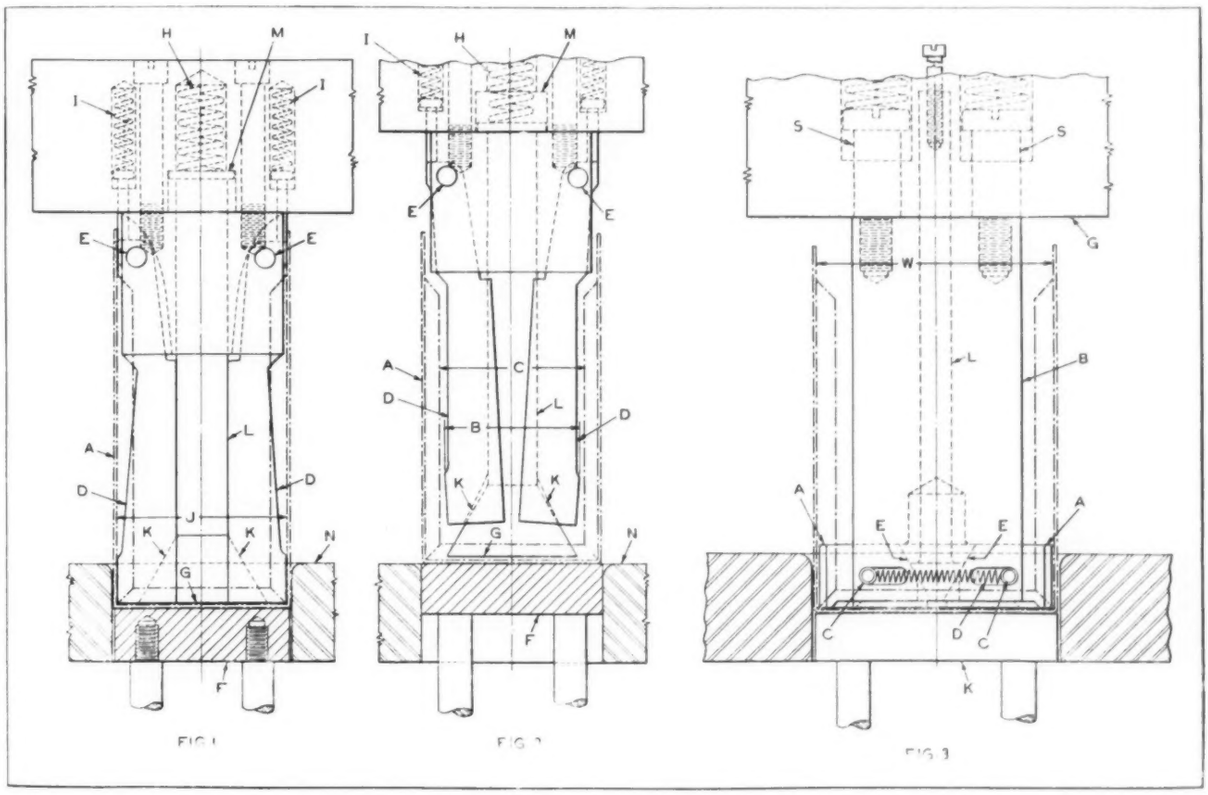


Fig. 1. Die with Expansion Punch for Forming Deep U-shaped Frame A from 0.0375 Inch Thick Cold-rolled Steel Channel, Shown at End of Down Stroke. Fig. 2. Die with Punch Collapsed to Permit Removal of Formed Frame A. Fig. 3. Die of Simple Design for a Forming Operation Similar to that Performed by Die Shown in Figs. 1 and 2

tween the edges of the channel and thus freeing the work from the punch. With the punch collapsed, as shown in Fig. 2, the formed work *A* can be withdrawn horizontally from the die. There are several designs of collapsible forming punches, the choice usually depending upon the width of the channel to be formed.

The first die operation performed in producing the frame shown at *A*, Fig. 1, is to notch the flat sheet material and form or bend up the edges to give the channel section the shape required. This operation is not illustrated, Figs. 1 and 2 showing only the die with the collapsible punch employed for the second operation.

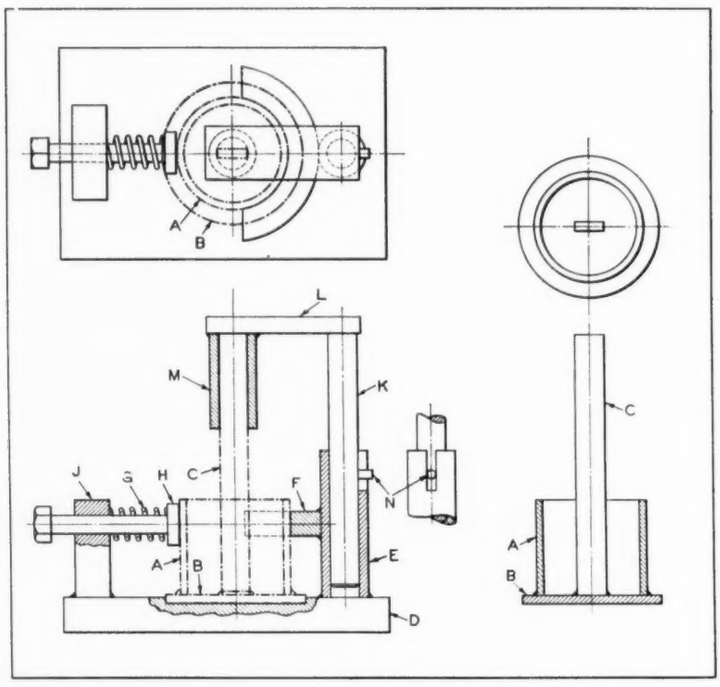
The two collapsible side arms *D* are pivoted on fulcrum pins *E*. The channel to be formed is located on spring pad *F* so that the descending punch first comes in contact with the work on surface *G*. As the punch continues downward, springs *H* and *I* are compressed and the punch is expanded to its full width *J* by the cam or angular surfaces at *K* when rod *L* "banks" at *M*. Upon further downward movement of the punch, spring pad *F* is depressed and the channel is formed to a U-shape within die-block *N*.

When the punch ascends, it is followed upward by the work until the top of pad *F* is flush with the surface of die *N*, as shown in Fig. 2. The punch, continuing to ascend, allows spring *H* to force rod *L* and its cam surfaces *K* downward, thus causing pivoted arms *D* to collapse and leave the finished work standing free on the pad, ready for removal, as shown at *A*, Fig. 2.

Another punch of simpler design used for a similar forming job is shown in Fig. 3. Forming punches *A* of this die are arranged to slide in a slot cut across the bottom of punch body *B*. This design can be used only when the width *W* between the formed sides of the channel is wide enough to permit using a slot of sufficient length to maintain accurate alignment of the forming punches when they are expanded to the full forming width.

Punches *A* are provided with pins *C* that slide in transverse slots cut through the sides of punch body *B*. Two tension springs *D* hold punches *A* in contact with angular or cam surfaces *E*. Punches *A* are moved inward and outward by cam surfaces *E* on rod *L* and the springs *D* in accordance with the movements of the press ram.

The two large shouldered screws *S* are sliding fits in punch-holder *G* and allow punch body *B* to move vertically. Compression springs over the screw heads cause body *B* to slide downward on rod *L* when the ram ascends. This action causes punches *A* to recede and to leave the finished work standing on the pad, ready for removal either by the operator or automatically by means of compressed air. In all cases, the springs used for collapsing the punches must have a weaker action than those used under pads *F* and *K*, Figs. 2 and 3.



Fixture Used in Assembling Members A, B, and C by Welding

Welding Fixture for Three-Piece Assembly

By JOSEPH WAITKUS, Wellsville, N. Y.

The welding fixture here illustrated is designed for use in assembling a product consisting of a tube *A* to which a cover *B* is welded; the cover, in turn, has a long, flat bar *C* welded to it in a perpendicular position at its center. In this case, it is desirable that the members of the assembly have an attractive appearance and that special attention be given to keeping bar *C* as nearly perpendicular to the cover plate *B* as possible.

A small tube *E* is welded to the base *D* of the fixture. The centering plate *F* is fastened to tube *E*. Directly opposite the centering plate is a pressure-exerting device consisting of a spring *G* and a plunger *H* supported by the lug *J* which is welded to the baseplate *D*.

A depression in baseplate *D* is made to fit the cover plate *B*. After the cover plate is in place, tube *A* is located against the centering plate *F*. The position of the centering plate with relation to the depression in the baseplate is such that the tube is automatically centered on the cover *B* and is held in place by the plunger *H* under the pressure exerted by spring *G*.

The bar *C* is held in place while it is being welded to cover *B* by rod *K*, fitted

into the tube *E* and provided with extension bar *L*, to which the bar-holder *M* is fastened. A hole is bored through holder *M*, the diameter being such that it fits neatly around the bar *C*, keeping the latter member in the correct position for welding.

In order to locate bar *C* on cover *B*, a pin *N* is fastened to rod *K* and fitted to a slot in tube *E*. With this arrangement, the welder need only insert bar *C* in the hole in *M* and lower it onto the cover plate *B* with the pin *N* located in the proper position. The weight of holder *M*, extension bar *L*, and rod *K* is sufficient to keep bar *C* in position.

In assembling the members, it is first necessary to weld bar *C* to cover *B*, after which holder *M* is raised and swung around in tube *E*, so that it is out of the way when performing the next welding step, which consists of welding tube *A* to cover *B*.

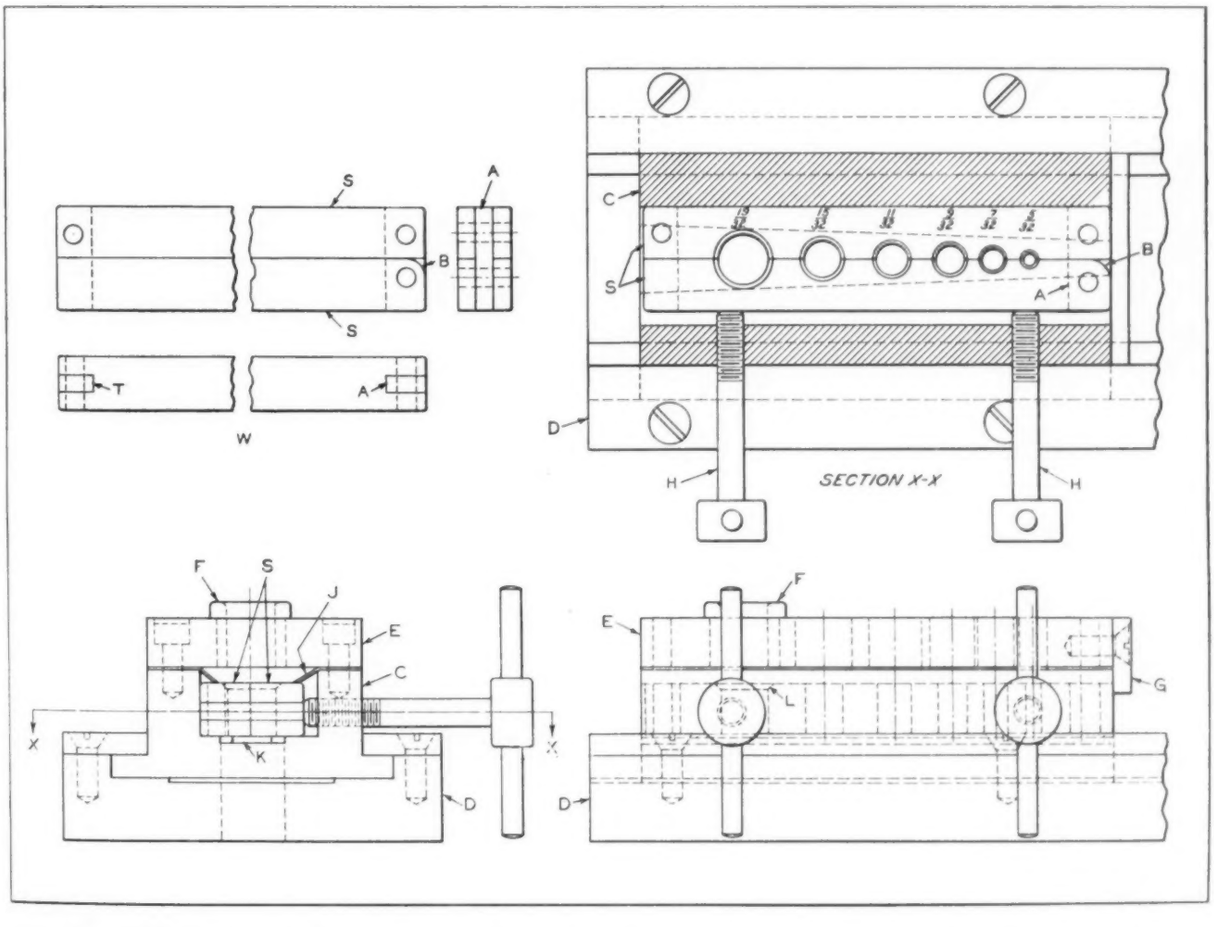
Jig for Drilling Swaging Block

By GEORGE WILSON, Mankato, Minn.

A jig used in a small shop for an unusual drilling job is shown in the accompanying illustration. The work *W* to be drilled consists of two clamping members *S*. When finished, the block serves as a swage, such as is employed by garage mechanics for gripping copper tubing while flaring the ends for union joints. The swage block, as indicated in the cross-sectional view of the jig, is drilled and countersunk to accommodate six sizes of tubing ranging from 3/16 to 5/8 inch in diameter. A yoke (not shown) which slides over the finished swage block carries a conical-pointed screw that can be forced into the end of the copper tube held in the swage block. The conical point of the screw thus forms the required flare or flange by forcing the end of the tube outward until it fits the deep chamfer in the swage block.

The first operation on the two 5/8-inch square pieces *S* consists of milling a slot across the ends of the pieces. One slot receives the hinge strap *A*, while the other receives the clamping piece *T*. One corner of half the pieces *S* is milled off on a radius, as indicated at *B* to permit the assembled block to be opened.

The work-holder *C* of the drill jig is free to slide on sub-base *D*. Plate *E* carries the drill bushings, one of which is shown at *F*. The two pieces *S* are placed in the jig with their ends located against stop *G* for drilling the six holes with their centers on the parting line between the pieces. Screws *H*



Jig Devised for Drilling Six Tube-clamping Holes in Split Block Used in Flanging Copper Tubes for Union Joints

are tightened to hold the pieces *S* clamped together against the wall of the jig.

A double-spindle drill press is used, so that approximately the proper spindle speeds can be employed for drilling the different sizes of holes. For drilling the smaller holes, the operator removes holder *C* from base *D* and holds it on the drill-press table with his hands. For the larger holes, the holder is slid into base *D*, which is clamped under the spindle that operates at a lower speed. Chips are cleared from the jig by compressed air, stop *G* being placed high, so as to facilitate chip removal.

Difficulty was experienced at first from chips becoming packed tightly between the work and the wall of the jig. This trouble was eliminated by applying the two thin pieces of steel *J* between the bushing plate and the body of the holder. These strips press lightly against the work and keep the chips out of the spaces between the jig walls and work. A channel *K* in holder *C* takes care of the burrs caused by the drills. To afford a better bearing for the work, the burr channel is made tapering from a width somewhat larger than the diameter of the small hole at the inner end to a width somewhat larger than the diameter of the large hole at the opposite end.

After the drilling is completed, bushing plate *E* is removed to permit tapping the holes with a fine-pitch thread which serves to give a better grip on the copper tubes. The sizes of taps used, as given in the view in the upper right-hand corner, adapt the members *S* for holding tubing of the following sizes: 3/16, 1/4, 5/16, 3/8, 1/2, and 5/8 inch. The holes are also chamfered deeply at this time, as indicated at *L*. Quick-acting chucks are used to permit changing the tools rapidly.

To assure uniformity in the depth of the chamfering, a stop-plate is placed in the jig for the work to rest on. This plate, 3/16 inch thick, is provided with short studs located in the center of each tube hole in the work. These studs stop the chamfering tool when it reaches the proper depth. The pieces *S* are kept in pairs, as drilled, since the drills sometimes have a tendency to run out slightly.

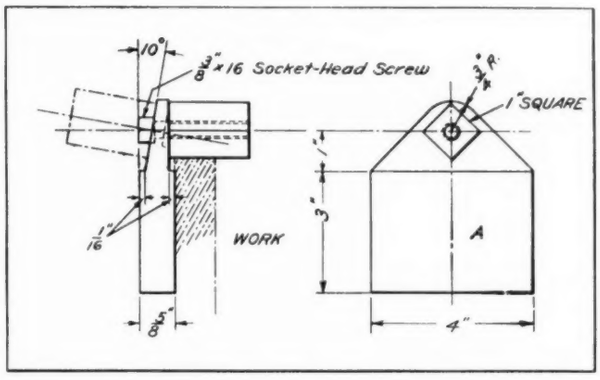
"Scraper Square" for Finishing Templets in Aircraft Plant

By STANLEY PORRITT, Philadelphia, Pa.

In large aircraft factories, a major part of the tool and die work consists of making templets, rubber-blanket type blanking and forming dies, and the more conventional types of dies in all manner of shapes and sizes. Many of these dies and forms, especially those for bomber wing ribs, are about 20 feet long, 6 to 8 inches wide, and 3/4 inch to 1 1/2 inches thick, with both edges filed to a continuous aerodynamic curve. The weight and size of these pieces make it difficult to handle them on a filing machine. They can be finished more quickly by clamping them in two bench vises, mounted 8 to 10 feet apart on a heavy bench, and working them down to the lay-out line with a heavy rasp or Vixen file, finally finishing them smooth by draw-filing.

The necessity for filing the edge of the form either square or to a cutting or shearing angle of 10 degrees slows up production, and it has been observed that a toolmaker spends as much time checking with a try-square as in filing. The "scraper square" shown in the illustration was designed to overcome this delay.

The blade of the square should be made from carbon steel and should be file-hard. The stock or body should be of die steel, hardened to resist wear. The construction shown makes possible either a square or a 10-degree angular setting. It can be



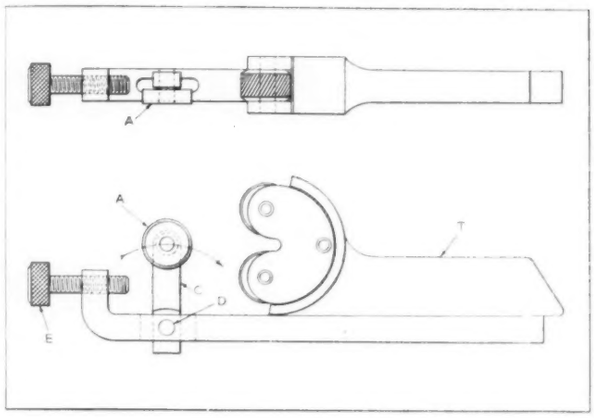
Scraper Constructed in the Form of a Square for Use in Finishing Templets and Dies Employed in Aircraft Plant

elaborated to the extent of making each corner of the stock a different angle, one square and seven angular settings being possible. Reaming and counterboring the hole for the screw at two different angles should offer no difficulty. The blade of the square is, of course, frequently reground to keep the edge straight and keen. If carefully made, it will be as accurate as a good try-square.

When the device is in use, the flat plate *A* is held against the back of the form, and the blade of the square is drawn vigorously back and forth over the edge of the work like a scraper, thus showing instantly any variation from squareness or the correct angle. It is much faster than a try-square, because it requires no visual effort; neither does it require the user to memorize the location, amount, and direction of the error, since the scraper leaves the surface in a condition which clearly shows where it touches or scrapes the work. In the case of white-metal or fiber-board forms, which are often employed, the scraper can be used directly as the finishing tool. On large work, with a three-man team—two men filing and a boy smearing the work with copper sulphate—the high spots can be rapidly scraped bright with the "scraper square," saving hours over the usual method of frequently testing with a try-square, which is necessary in the conventional procedure.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work



Work-supporting Attachment for Knurling Tool

Knurling Tool Attachment

A work-supporting attachment that can be placed under a knurling tool and held securely by the tool-post is shown in the accompanying illustration. This attachment is designed for use when it is necessary to knurl long pieces of small work, which has a tendency to spring away from the knurling wheels of tool *T*. By employing the attachment, the wheel *A* can be brought up against the work and held in place by the adjacent screw *B*, thus preventing any springing action.

It will be noted that the wheel *A* is set ahead of the knurling wheels a small amount. This is done to prevent it from marring the impressions produced by the knurling wheels. The wheel post *C* is, of course, free to pivot on stud *D*.

Denver, Colo. EVERETT MCDONALD

A Spacing Center-Punch

The article entitled "Spotting Screw for Transferring Blind Holes" in September, 1940, MACHINERY, page 133, brings up interesting recollections. About fifteen years ago the identical accessory for the tool kit was described under the title of "Center-Punch with Threaded Body." The writer thinks that such articles are worth reprinting for the benefit of apprentices who should put in some of their spare time making these and other things not readily purchasable for their own kits.

Another equally useful accessory is the spacing center-punch shown at *B* in the illustration. These punches should be made in sets of four, with nominal center distances *C* of 1/8, 3/16, 1/4, and 5/16 inch. It is excellent practice for an apprentice to file up these punches with spaces *C* 0.010 to 0.015 inch greater than the nominal drill diameter to provide for a land between the drilled holes, so that the drill will not run into an adjacent hole before passing through the work.

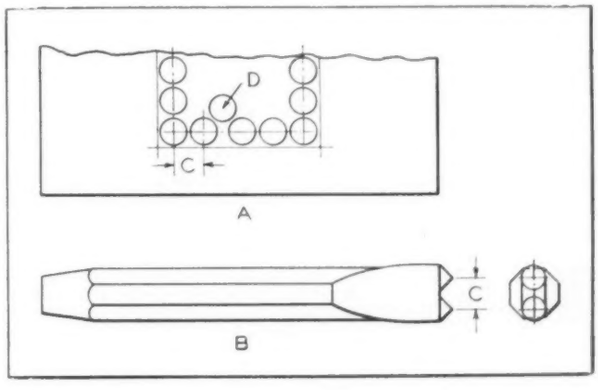
A little practice makes it easy to "step" around a lay-out, such as shown at *A*, finishing one punch mark at each blow of the hammer. It is unnecessary to calculate the space or distance around a section to be drilled out if the final center is punched as indicated at *D*.

Ontario, Calif. H. R. HAGEMAN

* * *

Lettering and Numbering by Cold-Stamping

Alloy-steel lettering and numbering type and dies which are hard enough to use for cold metal-stamping, have been developed by the Acromark Corporation, Elizabeth, N. J. A steel angle-iron, made from reclaimed railroad track, was cold-stamped with these dies after they had been used for 10,000 impressions. Although the hardness of the angle-iron was found to run up to 40 Rockwell C. in places, the resulting impression was sharp and clear. Examination of the dies, type, and holders showed little signs of wear.



Double-pointed Center-punch for Spacing Holes where Openings in Work are to be Removed by Drilling

Machine Tool Builders Deal with Defense Industry Problems

THE thirty-ninth spring convention of the National Machine Tool Builders' Association, held at the Hotel Cleveland, Cleveland, Ohio, May 5 and 6, was attended by a larger number of members than any previous meeting. The subjects dealt with by the speakers were all related to the machine tool industry's place in the Defense Program.

The president of the Association, Frederick V. Geier, president of the Cincinnati Milling Machine Co., in his address "The Machine Tool Industry in the Emergency," presented a most comprehensive review of what the industry has done to meet the needs of the nation in these critical days.

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Frederick V. Geier, President of the National Machine Tool Builders' Association

Some of the important points brought out by Mr. Geier were as follows: "When President Roosevelt wrote to Mr. Knudsen stating that it is essential to increase the number of vital machines manufactured, and that every critical machine in the United States must be used the maximum number of hours each week, he spoke of two problems close to the daily work of the machine tool industry. One is the building of more machine tools, and the other is getting more output from the machines already installed throughout American industry.

"Machine tool output, already far above previous levels, continues to mount month by month. Over 1000 machine tools of a wide variety of types are now being delivered to defense plants every day. This means that each day's production alone is large enough to equip a good-sized defense plant. But the magnitude of the defense problem is too great to be based on production of new equipment alone, and can only be accomplished by utilizing the great productive resources of the well over a million machine tools already installed in American industry. This would have an immediate and important effect in speeding up the defense program. Every hour that a critical machine stands idle in a manufacturer's plant represents lost production. Every additional hour that such a machine can be operated increases output.

"Three methods of stepping up output from existing equipment stand out as practical: (1) Operate this equipment more hours per week; (2) release critical machines from non-defense industries; and (3) obtain greater production per machine. This last suggestion is not simply a question of working equipment more hours per week; it is also a matter of the proper analysis and tooling-up of the job and the establishing of conditions under which the full output will actually be realized.

"While, of course, there are exceptions, it is not too much to say, generally speaking, that machine tool equipment now installed in the plants of this country could readily yield at least 10 per cent more output per hour under proper tooling and operating conditions, and in many cases the increase would be considerably more.

"Large-scale contracts for defense material were being placed with industry last fall, thereby creating a sudden and unprecedented demand for new machine tools. The American defense requirements for machine tools, as then stated by official sources, were put at $386,000,000. During the eight months since, the machine tool industry has already produced and shipped a volume of machine tools as great as that.

"Production has been stepped up month by month, with the result that by the end of December there was an increase in annual output of $250,000,000 over the previous peak production year. Speaking of this record, Mr. Knudsen said: 'The industry as a whole has done practically the impossible—I am appealing to you to do the impossible again.' This comment was deeply appreciated in the industry, coming from a man who so well understands the complex problems of machine tool production.

"The response of the industry has been magnificent. Last January Mr. Knudsen was advised that the $250,000,000 increase of machine tool output in 1940 would be topped by a $300,000,000 further increase in 1941, if all of the machine tool plants received enough orders to maintain capacity operations. While there have been some cases

where output has not increased so rapidly as it might, the record of the industry as a whole has been something of which it may well be proud. In the first quarter, output stepped up month by month, to $57,000,000 in March. At this rate, the $300,000,000 increase for 1941 will be met.

"Throughout the industry, subcontracting is practiced on a large and growing scale. This kind of production of parts and machines is augmenting output by the equivalent of 10,000 men. In its own plants, the industry has doubled the working force within the past year through the employment of 40,000 additional men. As fast as these men can be trained, they are being used to build up second and third shifts, particularly in the production of the critical machines that limit output.

"The complex shop problems which characterize the building of machine tools are well known, but we all know the added problems of multiple-shift operation. Many plants, however, have been attacking these problems with determination and resourcefulness and are succeeding in still further increasing the production obtained from key shop equipment above the 120 hours of operation per week which has been typical of the industry. This takes no account of the considerable amount of Sunday work which has been done in recent months to speed up individual deliveries. The industry also has 14,000 men in training, looking to the maximum utilization of existing plant capacity.

Machine Tool Industry Also Helps Defense Shops to Tool up for Production

"But building more machine tools is only part of the industry's defense job. More difficult, and at least equally important, is its part in helping to engineer and tool up defense plant production. In the automobile, electrical, and other industries, the machine tool builder has taken an important part in developing production methods which have resulted in more goods for more people at lower cost. This experience and these methods it is now helping to apply in the defense industries. Any number of entirely new machines have been designed and developed in record time to solve the problem of production of defense material for which there is no peace-time counterpart, such as the machining of armor plate and automatic weapon parts.

"In defense plants for Army, Navy, and aircraft production, machine tool engineers are analyzing and laying out methods to obtain maximum output per machine and per operator, and to secure and safeguard the limits of accuracy that will assure effective operation of weapons and equipment under combat conditions.

"In machine tool plants, hundreds of finished machines, each day, are set up, run off, and tested with their special fixtures, cutters, and gages, so that they are ready to go into immediate production the moment they are installed in defense plants. Some of these plants, however, are entirely new, and lack not only skilled operators, but sometimes supervisors as well. Helping to break in untrained operators and inexperienced supervisors is another big job on which the machine tool industry is lending a hand to help get defense production going. Hundreds of experienced machine tool men are on the job in these defense plants every day. One machine tool builder, for example, is building up a trained staff of over eighty men to render this kind of service in the field."

* * *

Precision Grinding Equipment Built in an Air-Conditioned Shop

Precision grinding spindles having a speed of 50,000 revolutions a minute are being manufactured at the plant of the Landis Tool Co., Waynesboro, Pa., in an air-conditioned department. Spindles running at such high speeds carry the grinding wheels of a special type of machine used in the ball-bearing industry. Because of the extremely rigid requirements of uniformity in temperature and other manufacturing conditions when assembling equipment of this character, these spindles are assembled in an air-conditioned room.

Two air-conditioning units, made by the Carrier Corporation, of Syracuse, N. Y., maintain a uniform temperature of 70 degrees F. and a dry, dust-free atmosphere. These units are installed in a specially constructed assembly room, which is carefully insulated with double walls, windows, and doors. Filtered air is admitted through the two air-conditioning units which supply 600 cubic feet of air per minute.

* * *

Continued Increase in Industrial Machinery Exports

The United States exports of industrial machinery in March, this year, were valued at $40,400,000, an increase of 8 per cent over the February shipments, according to the Department of Commerce. There was a gain over the preceding month of more than $4,000,000 in the exports of metal-working machinery.

The March exports of machine tools to England reached a value of $11,365,000, constituting well over 60 per cent of the total machine tool exports from the United States for that month. Exports to Canada during March totaled $4,615,000. This is the fifth consecutive month that the shipments to Canada have shown a gain. Exports to Japan amounted to $39,000, and to Russia $255,000. The total March exports of power-driven metal-working machinery were valued at slightly more than $20,000,000. Shipments of lathes amounted to $3,738,620; milling machines, $3,917,000; drilling machines, $1,303,640; and grinding machines, $2,704,950. Exports of metal-working machinery other than power-driven reached $1,906,000.

Machining Aircraft Propeller Gearing

Step-by-Step Operations in Machining Gears for Aircraft Controllable-Pitch Propellers on Automatic Chucking and Turning Machines

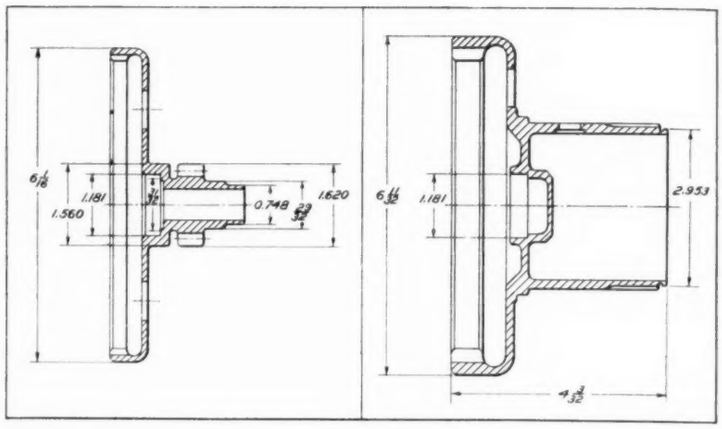


Fig. 1. (Left) Cross-section of Gear for Aircraft Controllable-pitch Propellers. Fig. 2. (Right) Cross-section of Another Gear Used in Aircraft Controllable-pitch Propeller Assemblies

THE two-spindle type of automatic chucking and turning machine developed during the last few years by the Potter & Johnston Machine Co., Pawtucket, R. I., enables either two identical operations to be performed simultaneously, or two different operations to be performed at one time if the diameters and lengths of the principal cuts are approximately the same in both operations. In the latter case, a piece of work can be completely machined within one cycle of the turret, usually by turning the piece end for end for the second chucking. The machining of two pieces at the same time is made possible by two sets of tools on each turret face.

A cross-slide unit operates in conjunction with the turret-slide, thereby providing for the taking of rough- and finish-facing cuts. Slide tools can also be mounted on the turret for taking facing, recessing, or similar cuts that require sidewise movement of the tools after they have been advanced into the work.

The gears shown in Figs. 1 and 2 are machined from steel forgings in four chuckings. The first two operations are performed simultaneously, and consist in rough-machining the forged blanks. Then, following heat-treatment, the two finishing operations are also performed on the two parts simultaneously.

Referring to Fig. 1, for the first chucking, the large open end of the piece is turned toward the spindle. It is gripped on the outside diameter by a three-jaw chuck. The operations on the projecting end of the gear are: (1) Spot-drill hole; (2) drill hole half way; rough-turn 29/32-inch diameter; rough-face shoulder; (3) rough-turn outside diameter to the jaws; rough-turn outside diameter of small gear; rough-face end of hub; (4) rough-face back side of small gear with slide tool; (5) semi-finish turn outside of small gear; (6) Finish-turn outside of small gear to 1.620 inches.

Now the small end of the gear is turned toward the spindle. The gear is gripped on that part of the large outside diameter that was machined in the previous operation. The machining operations then follow: (1) Spot-drill hole; (2) drill hole through; (3) rough-turn outside diameter to jaws; rough-bore inside of large gear diameter; machine 1.181-inch diameter counterbore; (4) rough-face web and form gear cutter clearance "groove" with single-point tool held in slide; face end at rim; (5) semi-finish bore inside of large gear diameter; (6) finish-bore inside of large gear diameter.

The parts, now being rough-machined all over, are heat-treated to 310 Brinell, and are then ready for the semi-finishing and finishing operations. In the first chucking, the large end of the gear is held toward the spindle, the gear being gripped on the outside by three jaws. The machining operations are as

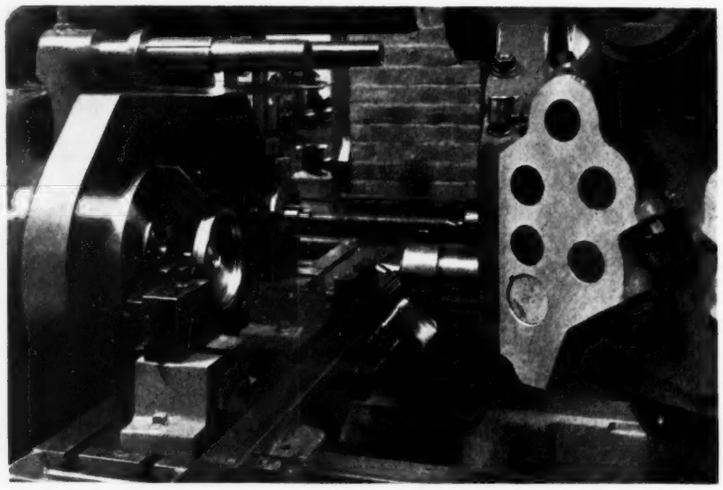


Fig. 3. Machining the Gear Shown in Fig. 1 on a Potter & Johnston Two-spindle Automatic Chucking Machine

follows: (1) Semi-finish turn the outside of the small gear; semi-finish turn the 1.560-inch diameter; machine groove for gear-cutter clearance; finish-turn 29/32- and 0.748-inch diameters; (2) semi-finish face back of gear with slide-tool; face outside rim; (3) take finish cuts on the same surfaces as in (1) except the groove; (4) finish-face back of gear with slide tool; form radius at large diameter of piece; face rim; finish groove; (5) break corners where necessary; turn gear diameter to size; (6) turn 1.560-inch diameter hub to size. Allow from 0.005 to 0.008 inch for grinding where required.

For the final operation, the small gear end is turned toward the spindle, the gear being gripped, as before, by three chuck jaws. The machining operations are: (1) Semi-finish bore the large gear diameter; semi-finish 0.181-inch counterbore and 31/32-inch counterbore; (2) semi-finish face web with slide-tool; (3) finish-bore inside of large gear diameter; bore hole; (4) finish-face web; finish-face rim with slide-tool; (5) ream hole; chamfer corners; (6) finish counterbore. Allow from 0.005 to 0.007 inch for grinding where required.

This completes the operations on the automatic chucking and turning machine on the piece shown in Fig. 1.

The machining time for the first and second chuckings, simultaneously performed, is 18.5 minutes, and the floor-to-floor time 19.5 minutes. The production per machine, allowing for idle machine time, is conservatively estimated at two and one-half gear blanks completely roughed per hour.

The machining time for the third and fourth chuckings, simultaneously performed, is 46.61 minutes, and the floor-to-floor time 47.5 minutes. The production per hour per machine, making ample allowance for idle time, is one gear blank, completely finished. One operator can readily handle three machines on this class of work.

For machining the part shown in Fig. 2 the procedure is approximately the same. Here the total machining time for the first two operations, simultaneously performed, is 26.22 minutes, and the floor-to-floor time 27.0 minutes. With due allowance for idle machine time, two gear blanks are completely roughed per hour. The third and fourth operations, simultaneously performed, require 48 minutes, the floor-to-floor time being 50 minutes. Allowing for idle machine time, one complete gear is finished per hour.

* * *

Either you sacrifice your personal selfishness for the nation—or you sacrifice the nation for your personal selfishness. Which of the two is your choice? In which of these two camps do you belong? Which, in your opinion, should be the American way?

Transfer Film Aids Defense Production

What is known as the "Matte Transfer Film," a photographic material for sensitizing metal plates to simplify—or rather eliminate—laying out operations, has been developed by the Eastman Kodak Co., Rochester, N. Y. This transfer film, which has proved itself capable of saving a great deal of time in the aircraft industry, is also applicable in the automobile industry or in any field where metal templets are used in laying out operations. According to an official of the Lockheed Aircraft Corporation, quoted by the manufacturer of the transfer film, the development of this process has cut aircraft production costs approximately $20,000 on each model.

By the use of this transfer film, drawings can be printed either by contact or by projection on the photo-sensitized metal sheets; from these sheets the templets are then cut out and used as patterns. In the contact method, the drawings are made on metal plates which have been given a coating of a material that will fluoresce when subjected to X-rays. The process can also be used for making enlargements of mechanical drawings on photo-sensitized metal plates.

* * *

Machine Tool Production Shows Continued Rise

According to information furnished by the National Machine Tool Builders' Association, machine tool shipments during April were valued at approximately $60,300,000, compared with $57,400,000 for March, and $54,000,000 for February. To date, the shipments of machine tools from American machine tool manufacturing plants, this year, have been approximately double the volume for the same period last year.

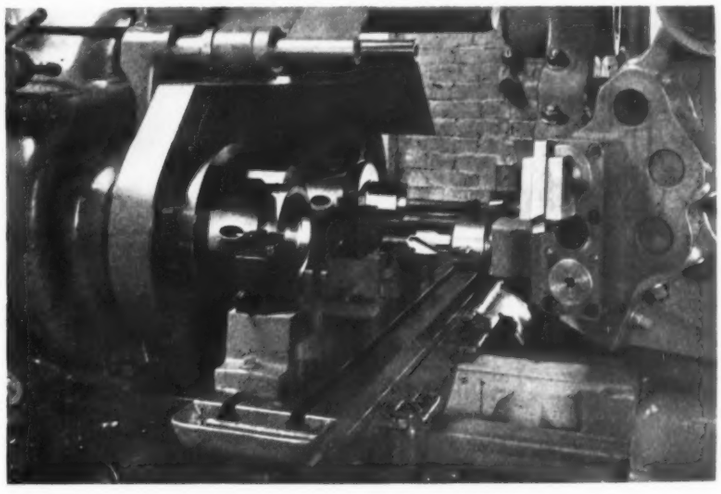


Fig. 4. Machining the Gear Illustrated in Fig. 2 on a Two-spindle Automatic Chucking Machine

Metal Trades Association Discusses Industrial Relations

THE forty-third annual convention of the National Metal Trades Association was held at the Palmer House, Chicago, Ill., Thursday and Friday, May 8 and 9. During the convention, many phases of industrial relations were dealt with, as well as some of the problems arising in connection with the Armament Program.

Among the papers read were the following: "Priorities," by Dr. S. S. Stratton, assistant director of minerals and metals of the Office of Production Management; "A Branch Program of Production Control," by C. G. Kopplin, production manager, Union Special Machine Co.; "International Economic Conditions and Ideas and Their Effects on America," by Dr. Julius Hirsch; "Fundamentals of Industrial Harmony," by F. Alexander Magoun, associate professor, Department of Humanics, Massachusetts Institute of Technology; "Training New Employes," by W. F. Coleman, W. A. Jones Foundry & Machine Co.; "Handling Employe Grievances," by George Seyler, the Lunkenheimer Co.; "Supervisory Training," by Bartley Whiteside, supervisor of training, Curtiss-Wright Corporation; "Labor and Government," by Congressman Howard W. Smith of Virginia, chairman of the House Committee which investigated the National Labor Relations Board.

A. H. Timmerman, Re-elected President of the National Metal Trades Association

At the annual dinner held on the evening of May 8, Colonel Louis Johnson, former Assistant Secretary of War, spoke on "The Job Ahead," and Leon Turrou, previously connected with the Federal Bureau of Investigation, spoke on "Fighting America's Fifth Column."

Labor-Leader Activities and the Defense Program

In his report of the year's activities, the president of the Association, A. H. Timmerman, dealt at length with the attitude of labor leaders toward the Defense Program. Many other current industrial relation problems were covered.

Mr. Timmerman pointed out how Mr. Knudsen, head of the Office of Production Management at Washington, has constantly stressed the need for greater and greater production—more and more machinery and war material must be manufactured. It takes both skilled and semi-skilled men to produce such machines and equipment. More skilled men must be trained if the entire industrial program is not to lag; but even if skilled men are available, increased production can be had only when satisfactory relations are maintained between management and men.

War production gets under way slowly. That this must be so is well known from the experience in the last war. But there are some factors in the present situation that are not so favorable as the conditions during the last war. For one thing, politics plays a greater part in the industrial situation today. "During the last decade," said the speaker, "we have seen increasing restrictions and burdens placed upon industry by Government, some of which are undoubtedly retarding our Defense Program.

"A second factor that is contributing to our labor crisis has been the apparent failure or inability of labor leaders to control their own members. This is obvious from the great number of strikes that have been called on the most trivial issues. Strikes threaten to bog down the defense effort in the United States.

Purpose of Strikes in the Defense Industries

"The strikes of today are not strikes for higher wages, shorter hours, or better working conditions. The strikes of today are strikes for more power and more control by labor union leaders over American industry and over all other American institutions. Some of these leaders no doubt want different social, economic, or political institutions in America, and some of them no doubt want only the personal power and money that come to a successful labor leader. But all of them are building to one end—to the end that labor leaders will dominate and control the industries.

"Every single strike in the defense industries today has, in fact, been for one thing—to strengthen the union leaders in their control over

employes and management; and it appears that every step taken by the Government since this epidemic of strikes in the defense industries started has resulted in strengthening the hands of labor-union leaders, and in making the inducement to strike greater."

In all defense strikes it appears to be the attitude of the Government that the increased costs involved in manufacturing war material, which, of course, must ultimately be paid by all of us, need not be considered so long as the union leaders obtain what they want—that is, prestige. The loss of management control over the efficiency of the work being done, on the other hand, means restrictions in production, higher costs, increased prices, a lower standard of living, and in many cases the failure of a business.

General Public is Gradually Becoming Aroused

The general public is gradually becoming conscious of the fundamental questions involved in the strikes that are taking place. Public opinion can be aroused and become very powerful as a result of the labor-leader attitude toward defense industries' strikes and toward the undermining of some basic principles on which our American way of living has been established.

"For example," said the speaker, "the spectacle of American men being refused the right to work for their Government during a period of national emergency unless they pay a union for the privilege of so doing is a national disgrace which deserves general condemnation. Our people sense slowly but surely that if this condition continues, the very personal liberty upon which the American nation has been so strongly built will be undermined. If a man cannot work for his own Government or cannot choose how he will spend his life, or for whom he shall work and to whom he will give his loyalty, without being dictated to by somebody else, then the much heralded personal liberty of America has been lost to a large group of our people."

The Government with its constant espousing of special group interests has nourished most dangerous forces—forces that can paralyze and destroy the productivity of industry not only in peace-time but also in war-time. The Government must have courage to control and modify its grants of power and license to these forces.

Mr. Timmerman, in his address, also dealt with the training of machine operators and specialists, the training of foremen, job rating, salary rating, and employe suggestion systems.

The following officers were elected for the coming year: A. H. Timmerman, of the Wagner Electric Corporation, St. Louis, Mo., president; Roe S. Clark, of the Package Machinery Co., Springfield, Mass., first vice-president; and H. H. Kerr, of the Boston Gear Works, Inc., North Quincy, Mass., second vice-president and treasurer.

Machine Tool Dealers' Meeting in Washington

THE subjects discussed at the spring meeting of the Associated Machine Tool Dealers of America held in Washington late in April practically all related to the problems facing the machine tool industry and the machine tool dealers because of the present emergency program. At this meeting, A. G. Bryant, of the Bryant Machinery & Engineering Co., emphasized the advantage to the defense industries, as well as to the machine tool building industry, of the intimate knowledge of dealer salesmen, who cover limited trade areas, of their customers' plants and requirements. This enables these men to serve the machine tool using industry quickly and efficiently. The speaker pointed out that the traditional cooperation between machine builders and dealers has been greatly strengthened during recent months, making it possible for both the machine tool building and the machine tool using industries to successfully meet the trying problems confronting them.

Philip M. McKenna, president of the McKenna Metals Co., referred to the importance of steel-cutting carbide tools in the armament program, mentioning that today shells are being turned with these tools at cutting speeds up to 450 feet per minute. L. B. Gillie, of the E. I. du Pont de Nemours & Co., Inc., presented a review of the manufacture and application of plastic materials. He mentioned especially that, although the first plastic celluloid was discovered some seventy years ago, and Bakelite was developed in 1907, the plastics industry did not become truly active until about ten or twelve years ago. Today, about 160,000,000 pounds of plastics are being molded annually in the United States in some 600 plants. The automotive industry is the largest consumer.

Mason Britton, director of the Machine Tool Section of the Office of Production Management, spoke on the tremendous problem of increasing the production of war materials. Wendell E. Whipp, president of the Monarch Machine Tool Co., spoke for the machine tool industry, emphasizing the cooperation between manufacturers and dealers. He said that the dealers serve as the eyes of the machine tool builder in reporting technical difficulties arising in the customers' shops. He predicted that machine tools will be developed in the near future that will far exceed in productive capacity anything that has been developed up to the present.

F. B. Scott, Jr., president of the Syracuse Supply Co., Syracuse, N. Y., who is president of the Associated Machine Tool Dealers, presided.

Gear Manufacturers Hold Twenty-Fifth Annual Meeting

THE twenty-fifth annual meeting of the American Gear Manufacturers' Association was held at Hot Springs, Va., May 5 to 7. As usual at the meetings of this Association, a great deal of attention was given to standardization problems. In addition, several papers were read on subjects of importance in the gear industry.

The meeting was opened by the president, U. Seth Eberhardt, who referred briefly to the conditions in the industry and its problems. Among the papers read before the meeting was one on "Microstructure versus Machinabliity of Alloy Gear Steels" by Dr. N. E. Woldman, of the Eclipse Aviation Corporation. E. L. Shaner, president of the Penton Publishing Co., dealt with "Procuring Materials in Times of Emergency"; and J. L. Buehler, of the Indiana Gear Works, spoke on "Special Problems Concerning Aircraft Gear Manufacture." A highly mathematical address was made by M. Maletz, engineer of the Kearney & Trecker Corporation, who spoke on "Analytical Determination of the Form Factor in the Beam Formula for a Tooth." At the twenty-fifth anniversary dinner, Paul Wooton, Washington manager for the McGraw-Hill Publishing Co., gave an inspiring address entitled "A Summation of Our National Defense Program."

W. P. Schmitter, Newly Elected President of A.G.M.A.

During the meeting, a recommended practice for the application and use of gear-motors was adopted. This practice incorporates the recently recommended standardized speeds that have been jointly sponsored and approved by the American Gear Manufacturers' Association and the National Electrical Manufacturers Association. It is expected that all the interested manufacturers will adopt the new standard speeds within the next couple of months. The balance of the program will take at least six months to be put into general use, due to the necessity of engineering and tool changes that must be made before the various manufacturers' lines can be completely adjusted to the new standard practice.

W. P. Schmitter, chief engineer of the Falk Corporation, Milwaukee, Wis., was elected president of the Association; John H. Flagg, president of the Watson-Flagg Machine Co., Paterson, N. J., was elected vice-president; and L. R. Botsai, manager of the gearing division of the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., was elected treasurer. J. C. McQuiston remains manager-secretary.

Semi-Annual Meeting of Mechanical Engineers to be Held in Kansas City

THE semi-annual meeting of the American Society of Mechanical Engineers will be held in Kansas City, Mo., June 16 to 19, with headquarters at the Hotel Muehlebach. There will be technical sessions during each day of the meeting covering a varied number of subjects, including education and training for the industries, power, fuels, petroleum, heat transfer, hydraulics, process industries, railroad mechanical engineering, management, and materials-handling.

The Oil and Gas Power Division of the American Society of Mechanical Engineers will hold a national meeting in Kansas City, June 11 to 14, immediately preceding the semi-annual meeting. At this meeting, there will be papers on engine foundations, Diesel engines, automatic protective devices, connecting-rod bolt failures, inspection instruments and procedure, and "centrifuging" of fuel and lubricating oil.

* * *

One of the lessons taught by the use of carbide cutting tools is that if steel tools are lapped or honed on the cutting edges like carbide tools, they, too, will give better results. In fact, this has long been recognized by those who have given careful attention to tool performance.

Low-Cost Method of Making Chuck Jaws for Holding Irregular-Shaped Work

A METHOD that greatly reduces the cost of making chuck jaws for holding irregular-shaped pieces through the use of a special bismuth alloy has proved successful in many metal-working shops. By using the part to be held as a mold and casting the alloy around it, the irregular shape can be reproduced in the chuck jaws. Because of its low melting temperature, this alloy—a product of Cerro de Pasco Copper Corporation, New York City, and known as "Cerromatrix,"—can be cast against forged metal parts, die-castings, rubber, wood, and most molded plastics without danger of burning or warping the piece. Its hardness and the fact that it expands slightly upon solidifying add to the advantages of the alloy for this purpose.

One of the initial stages in making two chuck jaws to hold a die-casting is shown in Fig. 1. The die-casting is held in position by two wooden spacers which are made by nailing two wooden strips to a thicker center piece, leaving a shallow groove the length of the spacer. This groove is filled with a babbitting clay and the spacer pressed against the die-casting to make the impression in the clay. The die-casting, spacers, and two brass retaining shells are then lined up as shown, and the shells are brought against the spacers and clamped in position. A sufficient quantity of the bismuth alloy is melted to fill the holder, taking care to stir well during the melting. The pouring temperature is between 300 and 350 degrees F.

After the alloy has solidified, the clamps are removed and the completed chuck jaws have the form shown in Fig. 2. The wide spacers between the halves of the brass holder prevent the cavities in the jaws from being any deeper than necessary to hold the piece firmly during machining. The spacers should be thick enough to keep the movement necessary in opening and closing the jaws to a minimum.

In many instances, chuck jaws costing as much as $160 and requiring a week or more to make by conventional methods have been made in the manner described for as little as $10, in less than two hours. Experience has demonstrated that these chucks will stand up for long production runs, having been used over 50,000 times in many cases without appreciable wear.

* * *

Gear Manufacturers Report Continued Increase in Production

The American Gear Manufacturers Association, with headquarters at 602 Shields Bldg., Wilkinsburg, Pa., reports that industrial gear sales for April were over two and a quarter times the sales in April, 1940, and slightly above the sales for March this year. Industrial gear sales for the four months ending April 30, this year, were almost two and one-third times the sales for the corresponding period of 1940. This applies only to industrial gears; it does not include automotive gears or gears used in high-speed turbine drives.

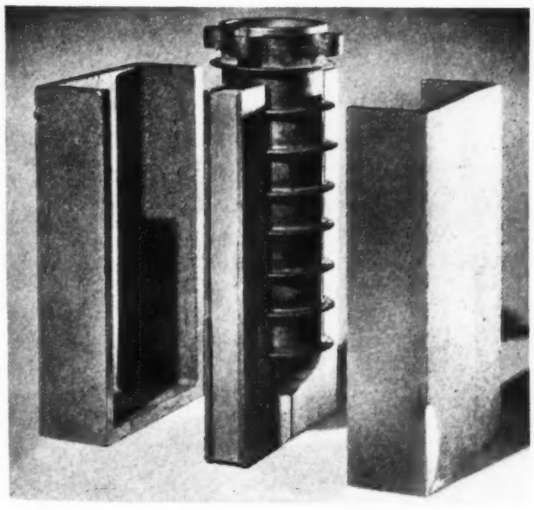


Fig. 1. First Step in Making Chuck Jaws is to Provide a Wooden Form to Hold Part in Place while Pouring Low-temperature Alloy around it into Metal Holders

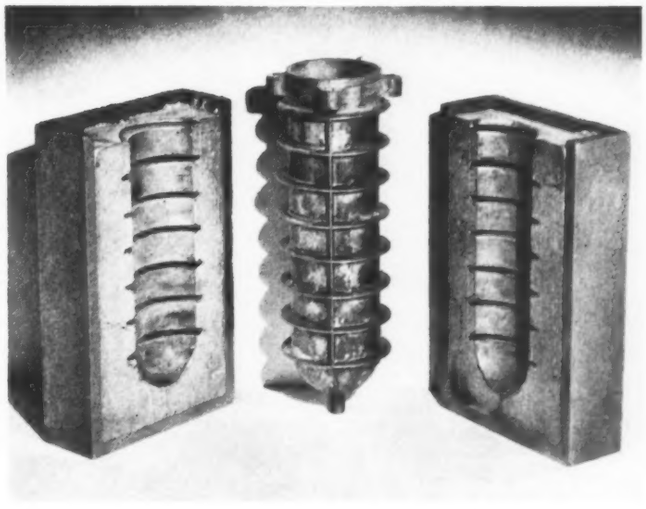


Fig. 2. These Completed Chuck Jaws Consist of Two Brass Holders Filled with Cerromatrix—a Low Melting Temperature Bismuth Alloy Cast to Fit Irregularly Shaped Part

Forty-Foot Boring Mill Installed in Westinghouse Plant

ONE of the world's largest adjustable-housing boring mills, capable of handling work up to 40 feet in diameter in normal operation, and up to 52 feet in diameter by eliminating the cross-rail and relocating the housings, is now at work machining large water-wheel stator frames at the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co. This new machine makes increased production possible by eliminating many of the special machining set-ups formerly necessary on the smaller boring mills in the shop.

Preparations for the foundation for this massive machine were started by scooping out over one thousand cubic yards of soil to a depth of 11 feet 6 inches over an area 50 feet square. One hundred and twenty concrete piles, each with a 10-inch diameter steel casing, were driven to a depth of 29 feet below the floor line; sixty-four of these piles support the machine proper and fifty-six support the 50-foot square by 14-inch thick floor plate that surrounds the machine. The concrete foundation mat is 18 inches thick, and the side walls are 10 inches thick. The completed foundation weighs 48,000 pounds, and supports the weight of the machine by means of sixty-eight leveling blocks resting on 2-inch steel plates which are grouted and dowelled into the concrete piers.

The cross-rail of the boring mill is a short-piece heavily ribbed box type casting with a 48-inch face width and a 69-inch depth. It is 52 feet long, and weighs 175,000 pounds. With feed boxes in place, the over-all length of the cross-rail is 65 feet. Complete with gear-boxes, saddles, rams, accessories, and electrical equipment, its total weight is 230,000 pounds. Raising blocks placed under the rail footings make this machine adjustable so that the cutting tools can be as high as 14 feet or as low as 2 feet from the table, with the boring-bars in their maximum "up" position. These raising blocks are made in heights of 2, 4, and 6 feet, providing height adjustments in increments of 2 feet.

With the rail and housings in their normal positions, work as large as 40 feet 3 inches in diameter will clear the housings. Two lifting bails are keyed and bolted at each end of the rail for the purpose of moving the entire assembly back from its normal position. This is done when it is necessary to use the boring mill as a floor type machine; with the aid of a portable boring and turning head, fixed to the table for boring or placed on the floor plate for turning, it is possible to bore or turn work up to approximately 56 feet in diameter.

The table of the machine is 30 feet in diameter, weighs 176,800 pounds, and is driven by a helical gear 25 feet in diameter with an 11-inch face width. The gear is driven by two pinions located diametrically opposite each other on the center line of the table. The drive to each table pinion is from a separate motor, both motors being balanced electrically to equalize the drive.

Every motion of table, rams, saddles, and feeds is motor-operated with control from a pendent switch at each side of the machine. To perform all

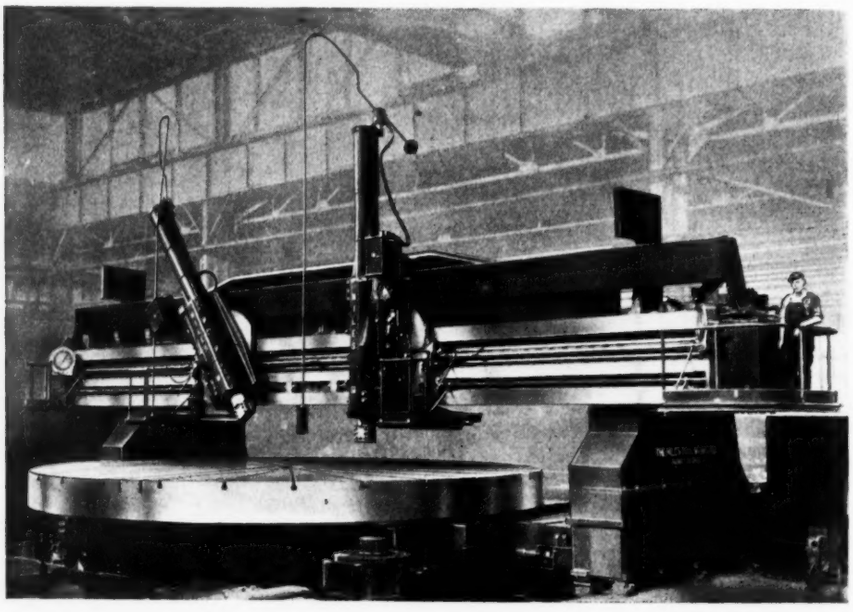


Fig. 1. This Forty-foot Boring Mill Incorporates Many New Design Features. Thirty-two Motors Provide Almost Any Action Required, in Addition to the Usual Functions of Drive and Feed

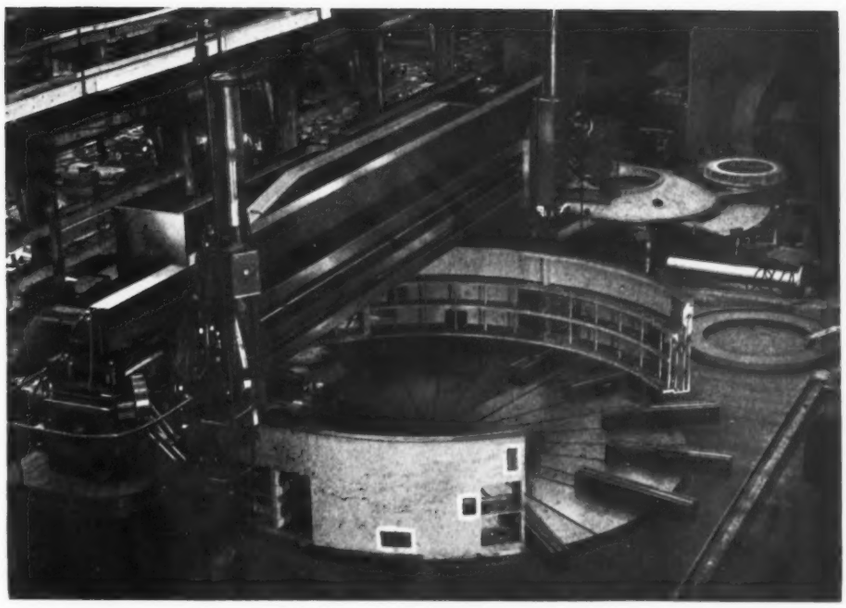


Fig. 2. The Completed Boring Mill Ready for Production. A Four-segment Steel Fabricated Rotor for a 35,000-K.W. Generator is being Assembled on the Machine for a 33-foot Bore

of these operations electrically there are thirty-two motors, which take the place of the conventional elevating screws for the rail and numerous other mechanical drives.

The complete machine weighs 705,000 pounds. The table loading limit is 576,000 pounds, making a total possible load on the foundation of 1,281,000 pounds. The time required to install the machine on its foundation and make it ready for production was sixteen weeks.

* * *

Machine that Automatically Reproduces Written Matter and Blueprints

Engineers of the Western Union Telegraph Co. have developed a machine known as the "Multifax," which automatically reproduces written matter, blueprints, or drawings on metal master plates, paper stencils, master copies, or tracings. The copies are exact facsimiles. Tabulations, forms, drawings, sketches, maps, etc., can be reproduced. Master copies 8 1/2 by 11 inches are made in twelve minutes; and copies 11 by 17 inches in twenty-four minutes.

The machine, briefly, consists of a metal cylinder or drum upon one end of which the original matter is placed, and upon the other, the metal plate, wax stencil, or other material on which the master copy is to be reproduced. The original is scanned by a beam of light which moves laterally along the revolving cylinder. The beam is reflected on a photo-electric cell, and the minute electrical currents generated are amplified to energize an electromagnet which operates a stylus impinging upon the material on which the master copy is to be reproduced. The operation of the machine is so simple that anyone can learn to use it in a short time.

Induction Heat-Treatment Applied to Bores of Diesel Cylinder Liners

Induction heat-treatment is now being applied to the hardening of the bores of cast-iron cylinder liners for Diesel tractor engines built by the Caterpillar Tractor Co., Peoria, Ill. This is said to be the first complete production application of induction heating to the cylinder bores of internal-combustion engines. It is an adaptation of a process that was developed by Budd Induction Heating, Inc., a subsidiary of the Budd Wheel Co., Detroit, Mich.

The treatment produces an interior cylinder surface of accurately controlled hardness to a specified depth, resulting in a longer wearing cylinder liner with greatly improved physical properties. The heat-treating machine hardens the inside of the liners to a surface hardness of 52 to 55 Rockwell C. Through subsequent tempering, a slightly lower hardness is obtained. The depth of the hardened layer is approximately 0.070 inch. Liners from 10 to 15 inches in length, with bores varying from 3 3/4 to 5 3/4 inches are so treated. Following the hardening and tempering operations, the bores are honed to a final finish after which the outside diameter of the liners is finish-turned for insertion in the cylinder blocks.

The finished sleeves are said to be superior in physical and wear-resisting properties to any previously produced by the company. While the bores are very hard, providing maximum resistance to wear, the sleeves are not brittle.

An interesting feature of this method of heat-treatment is the fact that the hardening operation serves as an additional check on previous inspections of the units treated, since the induction heat-treatment emphasizes any porosity or imperfections in the work that may have escaped visual surface examination.

Buick's New Method for Producing Torque-Tube Flanges

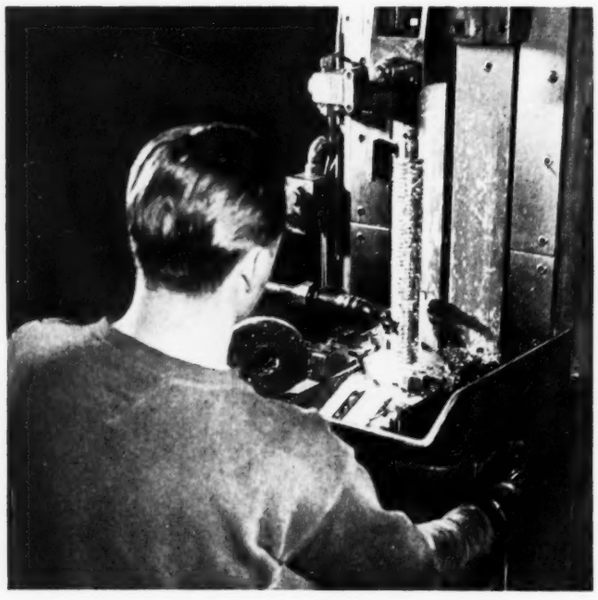


Fig. 1. The Piece to be Flanged, Blanked from Strip Stock, is Placed in an American Broaching Machine, which Enlarges and Smooths the Holes

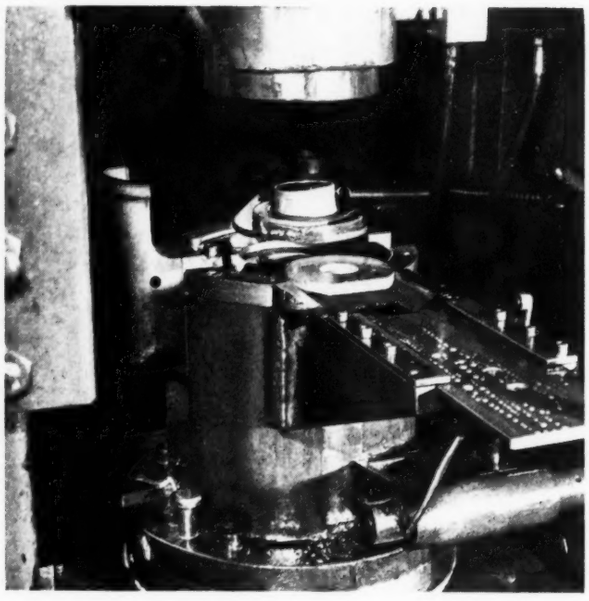


Fig. 2. Here a Swinging Arm is Removing One Flanged Piece, while another Piece is Ready to Slip into Place for the Extruding Operation

A NEW method of fabricating steel flanges for the ends of torque tubes in which an unusual extrusion operation is utilized has been developed by the Buick Motor Division of the General Motors Corporation, Flint, Mich. The results obtained indicate an appreciable improvement over the former method in which upsetting operations were used. These flanges are attached at each end of the torque tube, the one at the forward end being somewhat larger than that at the rear. In installing, they are drilled and bolted to universal joints at the transmission end and at the differential end.

Essentially, the present method of fabrication involves the blanking of disks from heavy-gage strip, with a hole in the center. The hole is then broached out slightly, and after this operation, the disk is forced down over a steel ball, extruding the required collar on the flange for subsequent welding to the torque tube proper.

The larger flange is of 9/16-inch low-carbon steel stock, the blank being 6 inches in diameter and formed with a 1 7/8-inch hole. Blanking is accomplished on a 600-ton Clearing press, after which the pieces are transferred to a 6-ton American vertical broaching machine, as shown in Fig. 1, which enlarges the hole to a 2-inch diameter and gives a smooth inside surface. The disks are then placed, one at a time, in a Williams & White 500-ton hydraulic press, Fig. 2, where, by forcing the disk *A*, Fig. 3, over the steel ball *B*, the hole is enlarged to 3 1/8 inches diameter and a 1 3/8-inch collar is extruded on the flange, as shown by the cross-section of the work at *C*, Fig. 4.

This is a most interesting operation. The lower die is cylindrical in shape, with a hole in the center large enough to permit passage of the steel ball. The ball rests on a tool-steel post, cupped out at the top, which passes through the die and is supported at the bottom on the bolster of the press, as shown diagrammatically in Fig. 3. The upper die *D* is cylindrical, having a cavity shaped with sufficient taper so that the formed collar is drawn down to 1/8 inch thickness at the top. The reason for tapering the collar in this way is to prevent the steel from opening up or cracking on the upper edge, a condition that developed when it was attempted to make the outer surface of the collar parallel with the inside surface.

As the dies close to hold the blank firmly in position and centered over the ball (see Fig. 3), they start to descend and the blank or disk *A* held between them is forced slowly and smoothly over the steel ball. The blank is kept flat by hydraulic pressure exerted on the insert *E* of the lower member *F* by a cylinder mounted below the press bed.

After the ball has performed the extruding operation, an air-operated plunger *G*, Fig. 4, pushes it into the passageway *H*, from which it rolls down into the chute *J*. This chute accommodates four balls and feeds them one after another on the center post *K*, one ball rolling into position on the post each time the member *F* is raised into position for the drawing operation. At the end of the upward stroke, the dies open, and an arm pivoted at the rear of the lower die swings in a horizontal plane to remove the formed piece from the dies, as shown in Fig. 2. The movement of this arm is effected by a vertical cam rail bolted to the press frame which bears against one end of the swinging arm. The travel of the press ram is 15 inches. Production averages about four pieces per minute.

The smaller flange is blanked from 7/16-inch stock. The blanks are 4 inches in diameter with a 17/32-inch hole, broached to 9/16 inch and then ball-formed to 1 9/16 inches, with a collar 1 inch deep. The broaching and press equipment are similar to that used on the larger flange, except that seven steel balls are carried in the auxiliary chute on the press.

One of the problems incident to the development of this method was that of obtaining satisfactory steel balls for the forming operation. Difficulty was experienced with the flange galling during the process, causing the steel balls to pick up metal on their surface and become rough and off size. Chromium-steel balls, ground and polished to a high luster, were tried first. Then it was decided to "Bonderize" the surface of the balls. This proved to be an improvement over the highly polished surface, but later it was decided to change to ground and polished high-speed steel balls, subjected to a four-hour Ferrox treatment, and these are now giving satisfactory service.

Another problem was the selection of a suitable lubricant for the forming operation. Many different types were tried, including various cutting oils, but it was finally determined that ordinary machine oil gave the best results.

* * *

Standard Abbreviations for Scientific and Engineering Terms

The American Standards Association, 29 W. 39th St., New York City, reports the completion of the revision of American Standard Abbreviations for Scientific and Engineering Terms. This standard has a very wide application, including terms all the way from such simple expressions as "pounds per square inch" to more complicated ones, like "reactive volt-ampere." The standardization work was undertaken under the auspices of the American Association for the Advancement of Science, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education. The standard is now available in pamphlet form, and can be obtained at a cost of 35 cents from the American Standards Association.

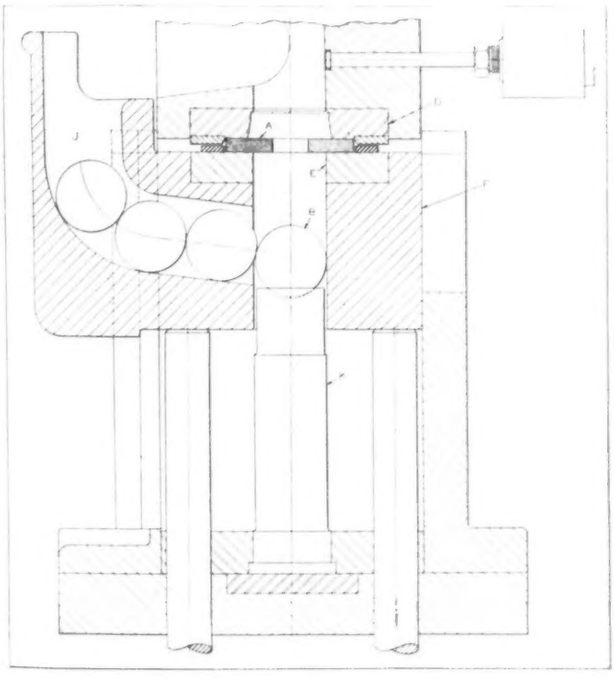


Fig. 3. Diagrammatic View Illustrating Principle of Operation of Extruding Die Shown in Fig. 2, in which a Flange Blank A is Forced down over a Ball B to Produce a Collar, as Shown at C, Fig. 4

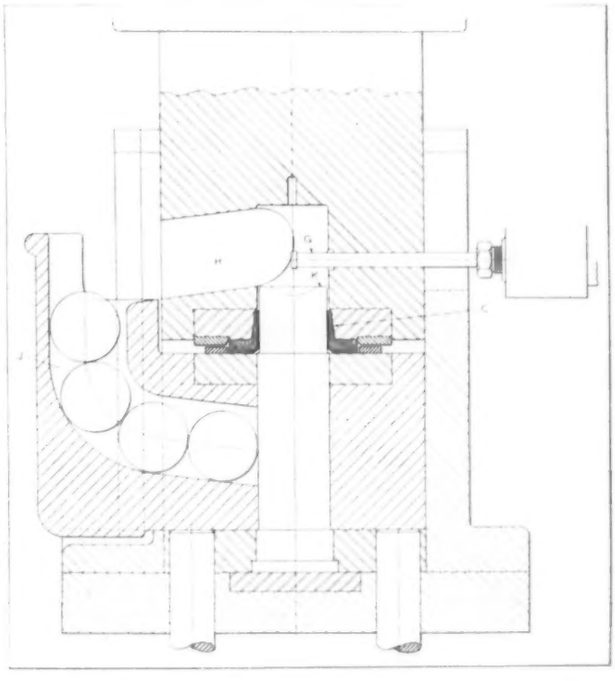


Fig. 4. Extruding Die at End of Down Stroke which Formed Collar C. The Ball Used for the Extrusion Operation has been Pushed from Post K by Pusher G and Returned Automatically to Chute J

Oxy-Acetylene Gouging — A Flame-Machining Process

By R. F. FLOOD, Service Engineer
The Linde Air Products Co., Chicago, Ill.

Fig. 1. The Gouging Process, Utilizing a Special Nozzle, will Cut a Smooth, Accurately Defined Groove in Steel Plate

OXY-ACETYLENE gouging is a rapid and economical method of removing a U-shaped groove of surface metal from rolled, drawn, forged, or cast steel. The development of the gouging process has resulted from a growing need for special oxy-acetylene equipment for removing weld metal from the under side of electric arc welds, and for removing weld defects revealed by visual, X-ray, or gamma-ray examination — operations normally involving a great deal of chipping with pneumatic hammers. Successful application of the process to this type of work has led to its use in many new operations and its subsequent expansion into new industrial fields.

The gouging process depends basically upon the design of a special nozzle to deliver a relatively large volume of oxygen at low jet velocity. This jet, coupled with proper preheat flame distribution, and guided by a simple gouging manipulation, will cut a smooth, accurately defined groove in the surface of steel plate, as shown in Fig. 1. By using different nozzles and manipulations, the groove can be varied in width and depth at the will of the operator. The process is somewhat similar to that of hand-deseaming, the principal difference being that the degree of accuracy of metal removal with a gouging blowpipe is considerably greater than that with a deseaming blowpipe.

In general, gouging applications can be classified in four groups. These consist of the following: (1) Progressive gouging of the under side of electric arc welds; (2) spot-gouging in the removal of defective weld metal and temporary tack-welds; (3) plate-edge preparation for welding; and (4) maintenance and scrapping operations.

Welding codes and general practice in most plants where steel vessels, tanks, and other welded structures are fabricated require the removal of the root of the initial weld before the back weld is made. This is done to provide conditions for highest weld quality when the final weld is made. This was one of the major applications for which the gouging equipment was developed, and many field trials bear out laboratory tests to prove that gouging is not only much faster, but also considerably more economical, than other methods of weld-metal removal.

At *A*, Fig. 2, is shown the conventional method of preparing a U-groove in weld design. The section enclosed by dotted lines is removed by gouging, brushed free of slag, and then electric arc-welded. The usual double-vee preparation is indicated at *B*.

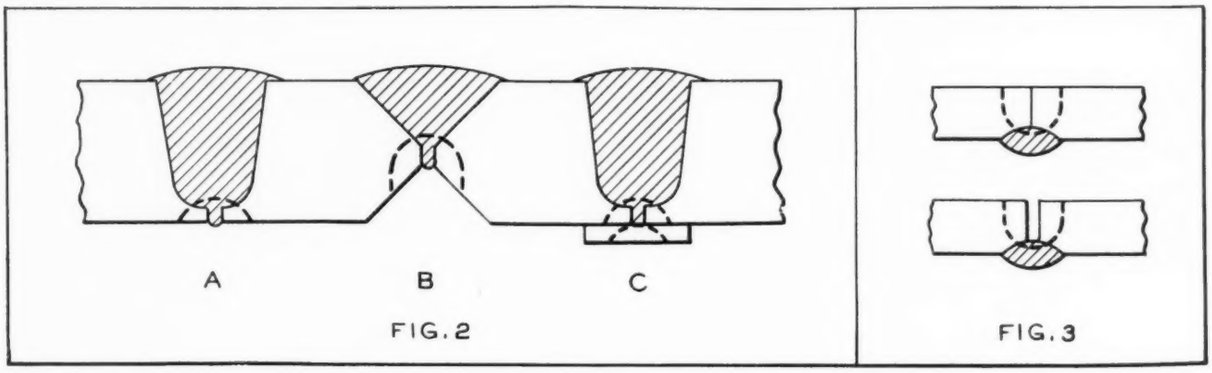


Fig. 2. (A) Removal of Initial Weld Root in U-groove Weld; (B) Removal of Weld Root in Double-vee Weld; (C) Removal of Backing-up Strip Used to Aid Initial Penetration. Fig. 3. Preparing Two Butted Plates for Welding. Gouging Forms Clean U-groove for Welding with Backing-up Bead in Place

Here the same procedure is followed as at *A*, the only difference being in the type of weld design. At *C* is shown the procedure used when a backing-up strip is used to aid penetration in the initial weld. Two passes are required, one to remove the backing-up strip and the other to remove the weld root as described at *A*.

The removal of weld metal, such as weld defects or temporary tack-welds, is classified as "spot-gouging." In this type of work, the need for positive control of the cutting action is of major importance. The gouging operator can quickly and accurately remove the spots or areas of metal which X-ray, gamma-ray, or visual inspection designate for removal.

A gouging application that is gaining in importance is the preparation of plate edges for welding. Three types of edge preparation are employed. First is the full U-grooving of abutting plate edges. Second is the J-grooving of a single edge for plate thicknesses up to 1 1/4 inches. Third is the U- or J-grooving of heavy plate, above 1 1/4 inches thick, by a combination of beveling and gouging. It should be mentioned that concentric rivet-cutting nozzles and other low-velocity oxygen nozzles have also been found useful for edge preparation, particularly on plate of heavier thicknesses.

Fig. 3 illustrates a speedy and economical method of preparing, simultaneously, two abutted plates for welding. The plates are abutted or spaced apart, as shown, and a single bead welded down the seam. The dotted portion is then removed by gouging to form a clean U-groove for welding with a backing-up bead in place. The initial bead may, or may not, be removed later. An excellent job can be done by hand in preparing joints of this type in plate up to 3/4 inch thick.

Another application of importance in which the gouging process has found immediate acceptance is in the field of maintenance and repair operations. The necessity of rapidly repairing and restoring to operation a piece of machinery that has broken down is a major factor in maintenance work. The welding processes were a particular boon for this type of work. Now, gouging complements the welding process to reduce the time still further.

The application of gouging to salvaging steel castings is becoming increasingly important. A steel foundry in Philadelphia reports a typical example of this work. A 12-ton rectangular steel section was recently cast by this firm. The surface of the casting in contact with the mold was covered with sand scabs and other defects. It was estimated that three days would be required to clean the casting by chipping with a pneumatic chisel, preparatory to repairing by welding. As an experiment, a small portion of it was cleaned in this manner, and a gouging operator was then put on the job and went over the cleaned portion again. The results proved that the chipping operation peened the metal over the defective areas so that large sand inclusions remained. The gouging, however, not only cleaned the casting thoroughly, but required only three hours to prepare the piece completely for repairing by welding.

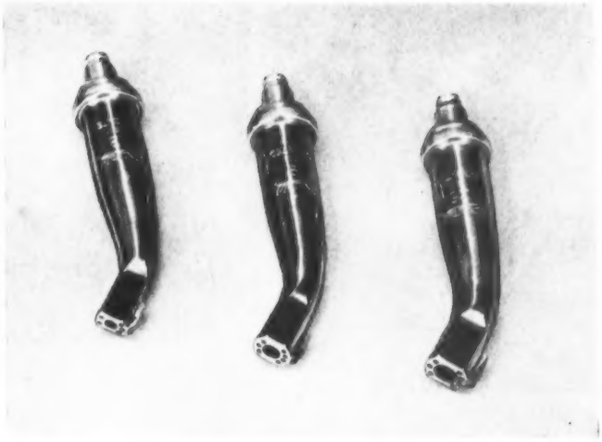


Fig. 4. Three Sizes of Gouging Nozzles Designed to Operate with Either Medium- or Low-pressure Acetylene

Fig. 4 shows three sizes of the gouging nozzles —Nos. 13, 19, and 25. They are designed to operate with either medium- or low-pressure acetylene. The nozzles are bent to provide clearance for the blowpipe body and to give better balance to the apparatus. A Haynes Stellite alloy skid protects the bottom of the nozzle from abrasion during the gouging operation.

* * *

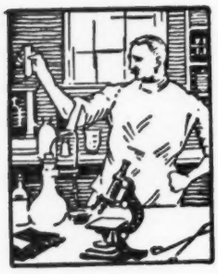
Making Sprockets with a Hand-Cutting Blowpipe

A pipe-line contractor has developed a fairly simple method for fabricating drive sprockets which should prove of interest to any shop that may require replacement sprockets.

According to *Oxy-Acetylene Tips*, these sprockets are part of the drive unit on ditching machines. Formerly, steel castings were used, but these sprang out of shape due to the severe service to which they were subjected, and had to be replaced frequently. Now, the sprockets are fabricated in the maintenance shop out of 1 1/4-inch steel plate. Although the fabricated sprockets cost about the same as the cast ones, they are stronger and last longer.

The first step is to cut the outside diameter of the sprocket with a hand-cutting blowpipe, using a homemade radius-rod as a guide. The radius-rod consists of a round bar, to which are attached a holder for the blowpipe nozzle, a riding wheel, and a center point. The next step is to drill equally spaced holes around the circumference of the sprocket blank. Then, using the hand-cutting blowpipe, the metal between the holes and the outside diameter is cut away and the teeth are trimmed to shape. The final operation is to weld a hub to the center of the sprocket.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Salvaging Castings by Impregnation with a Phenolic Plastic

The salvaging of machined castings that reveal slight porosity is being accomplished by impregnating them with a new phenolic resin known as Durez 7347A, which is manufactured by Durez Plastics and Chemicals, Inc., North Tonawanda, N. Y. This treatment has been used to a limited extent for some years, and has recently been adopted on a wider scale, due to the necessity for maximum production with minimum rejections. Many castings that must hold a certain pressure may appear satisfactory, but due to factors beyond the control of the manufacturer may not quite hold the specified pressure. Such castings can be made entirely satisfactory by impregnating them with this phenolic resin.

The impregnation is accomplished by forcing the resin into the pores of the casting under air pressure. In the case of small castings, this may be done in a suitable pressure tank. Larger castings may be sealed and the resin pumped directly into the casting. Pressures of between 45 and 100 pounds per square inch should be used.

After the resin has been forced into the casting under pressure, baking is necessary to thoroughly set the resin. Small castings may be baked in an oven for several hours at 250 to 275 degrees F.; but a preferable procedure is to bake them in a pressure tank, applying steam at 20 pounds pressure for two hours, followed by 100 pounds for two hours. Baking under pressure will produce a cleaner, smoother surface. Large castings may be baked by applying steam directly at the same pressures. Durez 7347A resin hardened in this way is practically impervious to water, solvents, mild alkalies, and acids.

Evidence of the reliability of this process is found in the fact that it has been approved by the Navy for use on certain types of castings for pumps.....201

Bearings Made from Bronze Bonded to Steel

A thin-wall laminated type of bearing consisting of bronze bonded to steel has recently been placed on the market by the Johnson Bronze Co., 508 S. Mill St., New Castle, Pa. The new bearing is known as "Pre-Cast Bearing Bronze on Steel." The bronze alloy used in making this bearing is S A E 64, consisting of copper, 80 per cent; tin, 10 per cent; and lead, 10 per cent. This alloy is first cast in the form of solid bronze bars and then the center of each casting is removed by drilling. The borings thus obtained are reduced to a powder,

Bronze Borings from the Center of Solid Bars, Powdered, Deoxidized, and Firmly Bonded to Strip Steel, Provide an Efficient Bearing Material. The Accompanying Illustration Shows Some Flat "Bronze on Steel" Bearing Plates Provided with Various Indentations for Lubrication Purposes

To obtain additional information about materials described on this page, see lower part of page 156.

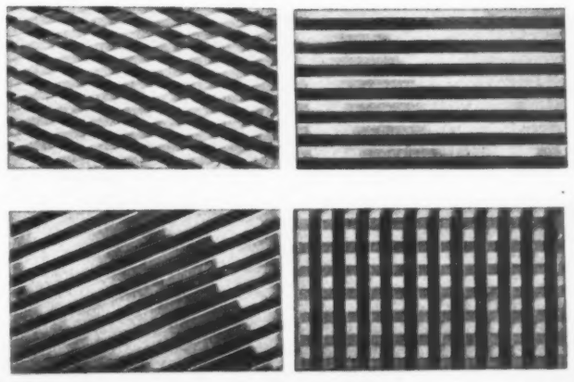
treated in a hydrogen furnace to remove all oxides, and then firmly bonded to strip steel.

In comparison with ordinary cast bronze, it is claimed that a higher Brinell hardness and a much greater resistance to pounding and shock, combined with a comparatively low coefficient of friction, are obtained. This combination of bronze and steel is also available as a graphited bearing. In this type, the graphite powder is thoroughly mixed with the bronze powder prior to the bonding operation, so that the graphite becomes an integral part of the bearing, and is not affected by oil, gasoline, or water.

"Pre-Cast Bearing Bronze on Steel" is available, in either plain or graphited form, as finished bearings, washers, strips, or in rolls up to 400 feet in length. Any type of oil-hole, groove, or slot can be readily incorporated in these parts.....202

New Plastic Film Finds Wide Application

A method of processing Koroseal—a synthetic thermoplastic material—so that it forms a transparent and highly durable film having many industrial applications has been announced by the B. F. Goodrich Co., Akron, Ohio. This film is resistant to outside exposure—sun, oxygen, and extreme temperatures—and in addition, it is highly water- and moisture-resistant. Its chemical inertness, flame resistance, and electrical properties make it valuable for laminating chemical containers used to hold acids and corrosives and for insulating fine electric wire and cable. It is also being used in molded gaskets, grommets, and in acid- and weather-resisting paints. This film is now being produced in gages from 0.001 inch up, and is available in a variety of colors in transparent, semi-transparent, translucent, and opaque forms. 203

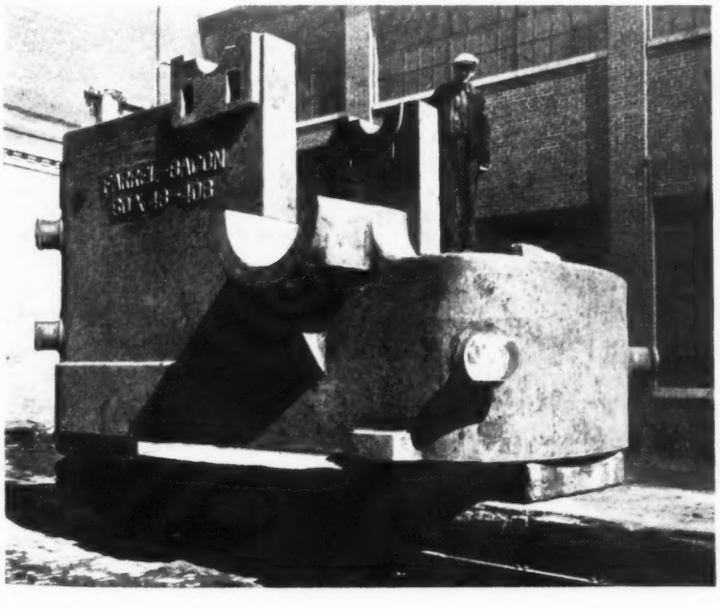


Diamond, Horizontal, Diagonal, and Square Patterns Now Available in American Bonded Pre-finished Metals

Bonded Pre-Finished Metals Available in New Crimped Designs

The introduction of several new crimped designs in bonded pre-finished metals has been announced by the American Nickeloid Co., Peru, Ill. One of these, termed a "7/16-inch crimp," is available in horizontal, diagonal, square, and diamond patterns and in a variety of metal thicknesses. Most of these patterns are obtainable in sheets up to 24 by 36 inches in size.

The second design, termed an "oval crimp," is obtainable in two widths of 1/8 and 3/16 inch, in long, continuous coils, and in thicknesses ranging from 0.010 to 0.015 inch. The rounded contour of the oval crimp makes it adaptable for inlay purposes. Both of these crimp designs are produced in bright or satin finishes of nickel, brass, chromium, or copper, electro-bonded to a base of steel, zinc, or brass. 204



A Meehanite Casting Weighing 136,000 Pounds—One of the Largest Ever Made in the Foundry of the Farrel-Birmingham Co., Inc., Ansonia, Conn. The Casting Forms the Bed of a Stone Crusher Capable of Reducing 4- by 4- by 5-foot Pieces of Rock to Crushed Stone for Highway and Building Construction. Twenty-nine Men Spent a Total of 588 Man-hours in Producing this Casting

To obtain additional information about materials described on this page, see lower part of page 156.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Fill in on Form at Bottom of Page 155 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the June Number of MACHINERY

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GEA-2176, on G-E Selsyns for remote signaling, control, and indication; Bulletin 2677, entitled "How to Start and Protect a Synchronous Motor for Best Results"; Circular 2456, entitled "More for Your Control Dollar"; Circular 3539, on G-E heating cable; Bulletin 3571, entitled "Cut Precious Minutes from Production Time with G-E Plugging Control." 1

Buyer's Guide for Steel Users

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill. 1941 Stock List (268 pages) comprising a complete steel buyer's guide. In addition to listing all Ryerson Certified Steel products carried in stock, the book contains S A E standard specifications, a physical properties chart showing machinability of more than fifty steels, standard gage comparisons, weight tables, and other helpful data. 2

Tool Steel Selection

CARPENTER STEEL CO., Reading, Pa. 159-page Tool Steel Manual, designed to simplify tool steel selection and heat-treatment. Specific steels are recommended for all types of tools and dies in general use. The material previously published in the Carpenter Matched Tool Steel Manual has been revised to accord with the latest practice, and is included. The book is provided with a quick-reference index. 3

Thread-Rolling Machines

WATERBURY FARREL FOUNDRY & MACHINE CO., Waterbury, Conn., is publishing a series of circulars, Nos. 916-A, 917-A, 918-A, and 919-A, describing, respectively, inclined screw-thread rolling machines with lift-blade feed; inclined screw-thread rolling machines with chain feed; horizontal screw-thread rolling machines with hand feed; and inclined screw-thread rolling machines with side hand feed. 4

Lubricators and Control Units

C. A. NORGREN CO., INC., Denver, Colo. Catalogue 400, covering the Norgren line of pneumatic products, including Lubro-Control units for the control, cleaning, and lubrication of air, as well as the Norgren system for oiled-air lubrication for high-speed spindle bearings. 5

Oxy-Acetylene Welding and Cutting

THE LINDE AIR PRODUCTS CO., UNIT OF UNION CARBIDE AND CARBON CORPORATION, 30 E. 42nd St., New York City. Booklet 4694, entitled "What the Purchasing Agent Should Know about Oxy-Acetylene Welding and Cutting Equipment and Processes." Booklet 4062B, entitled "Opportunities for Profits with Portable Machine Cutting." 6

Electric Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Catalogue Section, 43-414, describing improved alternating- and direct-current ammeters and voltmeters for general use. 1941 revision of the Westinghouse "Quick Selector" catalogue, designed to simplify the selection of electrical equipment for any motor, lighting, or feeder circuit. 7

Roller Bearings in Defense Equipment

TIMKEN ROLLER BEARING CO., Canton, Ohio. Catalogue entitled "The Vital Importance of Timken Bearings in National Defense," showing the important part played by Timken tapered roller bearings in the machinery used for making defense equipment and in the defense equipment itself. 8

Power Squaring Shears

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 72-B, descriptive of Niagara power squaring shears, built in a complete range of sizes and lengths for use in aircraft, ordnance, shipbuilding, automotive, and other metal-working industries. 9

Oil-Retaining Bearings

BOUND BROOK OIL-LESS BEARING CO., Bound Brook, N. J. Die List, giving the sizes of Compo oil-retaining, porous bronze bearings quickly available from tools and dies on hand. The data covers sleeve and flanged type bearings and thrust washers. 10

Materials-Handling Equipment

CLARK TRUCTRACTOR DIVISION OF CLARK EQUIPMENT CO., Battle Creek, Mich., is distributing a special issue of the *Clark Pictorial*, devoted to defense production and describing how the use of Clark truck-tractors speeds up work. 11

Industrial Controls

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Catalogue 77-1, on Brown and Minneapolis-Honeywell industrial power units and motorized valves designed to operate with Brown control instruments. 12

Metal-Working Equipment

YODER CO., W. 55th St. and Walworth Ave., Cleveland, Ohio. Bulletin illustrating and describing Yoder metal-forming and allied equipment for use in the aircraft and automotive industries, structural shops, steel mills, etc. 13

Self-Aligning Pivot Ball Bearings

MINIATURE PRECISION BEARINGS, associated with the SPLIT BALLBEARING CORPORATION, Lebanon, N. H. Circular descriptive of a new self-aligning pivot ball bearing for radial and thrust loads. 14

Copper Alloys

REVERE COPPER & BRASS, INC., 230 Park Ave., New York City, is dis-

tributing three catalogues containing data on copper and copper alloys suitable for use in the mechanical industries, process industries, and power plants, respectively. 15

Plastic Products

GENERAL ELECTRIC CO., Plastics Department, Pittsfield, Mass. Folder entitled "The Change to Plastics," containing twelve case histories showing how plastics have been used in making parts formerly made of other materials. 16

Automatic Press-Room Equipment

U. S. TOOL COMPANY, INC., Ampere (East Orange), N. J. Bulletin 50, illustrating and describing automatic press-room equipment, including slide and roll feeds, stock straighteners, stock reels, etc. 17

Involute Measuring Machines

FELLOWS GEAR SHAPER CO., Springfield, Vt. Catalogue illustrating and describing Fellows involute measuring machines for charting involute profiles, available with electric recording device. 18

Metallizing Equipment

METALLIZING ENGINEERING CO. INC., 21-07 Forty-First Ave., Long Island City, N. Y. Bulletin 42, entitled "Metco Metallizing Equipment and the Metallizing Process." 19

Collapsible Taps

MODERN TOOL WORKS DIVISION OF CONSOLIDATED MACHINE TOOL CORPORATION, Rochester, N. Y. Bulletin M-111, describing in detail the new Modern collapsible taps arranged for stationary or rotary operation. 20

Precision Tapping and Threading Machines

BAKEWELL MFG. CO., 2427 E. 14th St., Los Angeles, Calif. Catalogue illustrating and describing the construction of Bakewell precision tapping and threading machines. 21

Hydraulic Presses

A. B. FARQUHAR CO., LTD., York, Pa. Bulletin 41-H-02, illustrating and describing Farquhar self-contained hydraulic presses built in a complete range of types, sizes, and capacities. 22

Rubber Hose

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., 34 Townsend St., Passaic, N. J. Bulletin 6879, outlining the advantages of Condor Homo-Flex air, water, and oil hose. 23

Welding Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Descriptive Data 18-335, on Ignitron spot-welding timers for controlling the welding of aluminum, heat-treated alloys, and other materials. 24

Hydraulic Cold-Saws

MOTCH & MERRYWEATHER MACHINERY CO., Cleveland, Ohio. Bulletin describing hydraulic cold-sawing machines with attachments for sawing shell slugs, as well as the new Motch & Merryweather saw grinder and saw blades. 25

Welding Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GEA-569F, descriptive of multiple-operator arc-welding systems for manual or machine welding with metallic or carbon electrodes. 26

Geared-Head Lathes

AXELSON MFG. CO., 6160 S. Boyle Ave., Los Angeles, Calif., is distributing six new bulletins describing in detail the various sizes of Axelson heavy-duty, twenty-four-speed, geared-head lathes. 27

Vertical Mill and Jig Borer

MACHINERY MFG. CO., 1915 E. 51st St., Vernon, Los Angeles, Calif. Folder descriptive of the Vernon vertical mill and jig borer for low-cost precision work on jigs, fixtures, and dies. 28

Toolpost and Tailstock Turrets

JEFFERSON MACHINE TOOL CO., Fourth, Cutter, and Sweeney Sts., Cincinnati, Ohio. Circular illustrating and describing the Jefferson four-tool toolpost turret and five-tool tailstock turret. 29

Ampco Metal Aircraft Parts

AMPCO METAL, INC., Milwaukee, Wis. Engineering Data Sheet No. 88, describing the use of the X-ray in testing Ampco Metal parts in a large aircraft plant. 30

To Obtain Copies of New Trade Literature

listed on pages 154-156 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

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Flame-Hardening Machines

FELLOWS GEAR SHAPER CO., Springfield, Vt. Catalogue descriptive of the Fellows flame-hardener equipped with automatic time control for the local hardening of ferrous materials. 31

Grinding Wheels

NORTON CO., Worcester, Mass. Circular entitled "Quiz the Operators," outlining six reasons why operators prefer to use Norton resinoid grinding wheels. 32

Die Steel

JESSOP STEEL CO., 605 Green St., Washington, Pa. Bulletin 141, descriptive of Jessop "New Process" cold-header die steel. Information on heat-treatment is included. 33

Shell Forging Presses

BALDWIN SOUTHWARK DIVISION OF THE BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa. Bulletin 110, illustrating and describing Baldwin-Omes shell forging presses. 34

Hydraulic Power Saws

PEERLESS MACHINE CO., Racine, Wis. Bulletin 50-A, on high-duty metal-cutting power saws, showing applications of these machines on defense work. 35

Welding Positioners

RANSOME CONCRETE MACHINERY CO., Dunellen, N. J. Bulletin 176, describing improvements in Ransome 3- and 8-ton capacity welding positioners. 36

Drill Grinders

BLACK DIAMOND SAW & MACHINE WORKS, INC., Natick, Mass. Bulletin 122, illustrating and describing Black Diamond precision drill grinders. 37

Electric Heat-Treating Furnaces

HEVI DUTY ELECTRIC CO., Milwaukee, Wis. Bulletin HD-441, on box type electric furnaces. Bulletin HD-341, on heavy-duty multi-range convection furnaces. 38

Gas Furnaces

JOHNSON GAS APPLIANCE CO., Cedar Rapids, Iowa. Bulletin IF-241, announcing Johnson gas furnaces for heat-treating and other industrial uses. 39

Hydraulic Bulldozers

LAPLANT-CHOATE MFG. CO., INC., Cedar Rapids, Iowa. Circular A-112-638, describing LaPlant-Choate hydraulic bulldozers. 40

Drafting-Room Equipment

ENGINEERING SALES CO., Sheboygan, Wis. Catalogue 2A, listing a full line of equipment for the drafting-room. 41

Zinc-Blackening Process

ENTHONE CO., New Haven, Conn. Bulletin descriptive of Ebonol Z—an immersion process for blackening zinc and its alloys. 42

Precision Boring Machines

STOKERUNIT CORPORATION, 4547 W. Mitchell St., Milwaukee, Wis. Bulletin descriptive of Simplex precision boring machines. 43

Collet Chucks

ERICKSON STEEL CO., 80th and Bessemer Ave., Cleveland, Ohio. Circular descriptive of the Erickson precision collet chuck. 44

Electric Motors

HOWELL ELECTRIC MOTORS CO., Howell, Mich. Bulletin RS-60, descriptive of a new protected type motor. 45

Variable-Speed Control

REEVES PULLEY CO., Columbus, Ind. Circular showing how production was increased by the application of Reeves variable-speed control. 46

Airflex Couplings

FALK CORPORATION, Milwaukee, Wis. Bulletin 8100, illustrating and describing five types of Falk "Airflex" couplings. 47

Boring-Bar Holder

D. H. SKEEN & CO., 1 N. LaSalle St., Chicago, Ill. Bulletin showing applications of the Walker "Hole Hog" boring-bar holder. 48

Strip-Chart Recorders

BRISTOL CO., Waterbury, Conn. Bulletin 570, illustrating and describing strip-chart recorders. 49

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 157-172 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description on pages 157-172—or write directly to the manufacturer, mentioning machine as described in June MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on other side of this blank.

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 152-153, fill in below the identifying number found at end of each description on pages 152-153—or write directly to the manufacturer, mentioning name of material as described in June MACHINERY.

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[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Jones & Lamson Automatic Internal Thread-Grinding Machines

The Jones & Lamson Machine Co., Springfield, Vt., has brought out a line of new, fully automatic, internal thread-grinding machines. These machines are available in three models. The Model TG-63 has a swing of 7 1/2 inches, and will grind threads up to 6 inches in diameter with a maximum length of 3 inches in work having an over-all length of 10 inches. A separate lead-screw and nut is required for each pitch. This light-weight model will handle work within its capacity at a high production rate.

Model TG-624 has a swing of 7 1/2 inches, and will grind threads up to 6 1/2 inches in diameter with a maximum length of 5 inches in work having an over-all length of 24 inches. This model is completely universal and will handle tool-room or production work of any size or weight within its rated capacity.

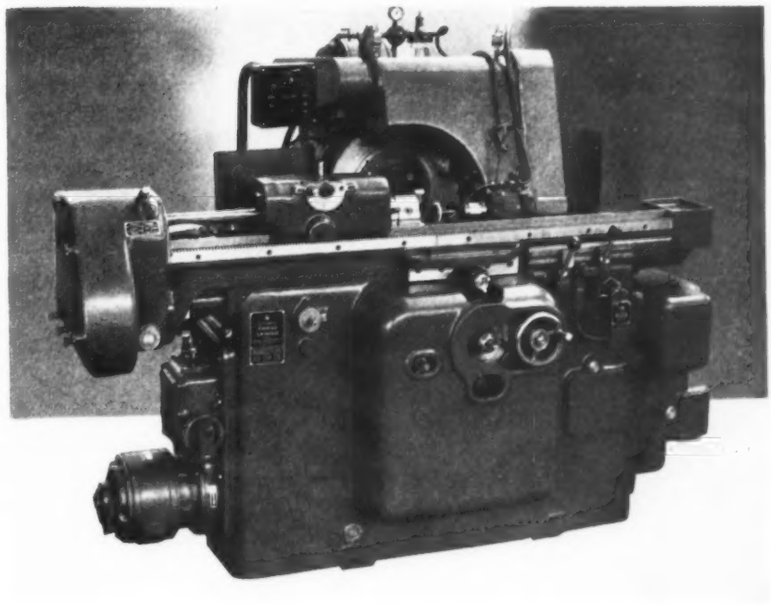
Model TG-1230 has a swing of 21 inches, and will grind threads up to 14 inches in diameter with a maximum length of 5 inches in work up to 24 inches in over-all length. This model is also a completely universal machine.

A hardened and ground master lead-screw and pitch change-gears are furnished as standard equipment for grinding any pitch thread from 2 to 48, inclusive, either right or left hand, and of either single, double, triple, quadruple, or sextuple lead on Models TG-624 and TG-1230. On all models the grinding wheel spindle is automatically withdrawn from the grinding position to the wheel-dressing position, the wheel is dressed automatically, and the grinding wheel spindle is returned to the working position. The amount dressed off the wheel is compensated for automatically, and the machine feeds in automatically on successive cuts until the correct size is reached. At this point, the wheel-spindle is automatically moved to the dressing position, and the machine stopped. Each model is provided with a direct-current wheel-driving motor having rheostat control to give a complete range of grinding wheel speeds.

An air cylinder is used to obtain rapid movement of the grinding wheel spindle from the working to the dressing position and vice versa. All units thus far furnished have been air-operated, but hydraulic operation is possible, and machines can be equipped for this method of operation. Ample clearance is provided for gaging and changing work. When the machine is in the gaging position, a safety device locks the grinding wheel spindle in place to prevent accident to the operator while gaging or changing the work or in the event that the air pressure should fail. 51

Marking Tool with Interchangeable Letters

New Method Steel Stamps, Inc., 149 Jos. Campau Ave., Detroit, Mich., has developed a rotary or roller type marking device in which the letters or figures are interchangeable and which makes possible the rapid marking of cylindrical parts in production, such as shells and other ordnance units, indexing dials, rolls, etc. This marking tool has been installed on numerous automatic screw machines and turret lathes, and has proved satisfactory in making clean-cut identifying marks in high production. 52



Automatic Internal Thread-grinding Machine Brought out by Jones & Lamson Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 156.

Fig. 1. Waterbury Farrel Thread-rolling Machine with Lift-blade Hopper Feed

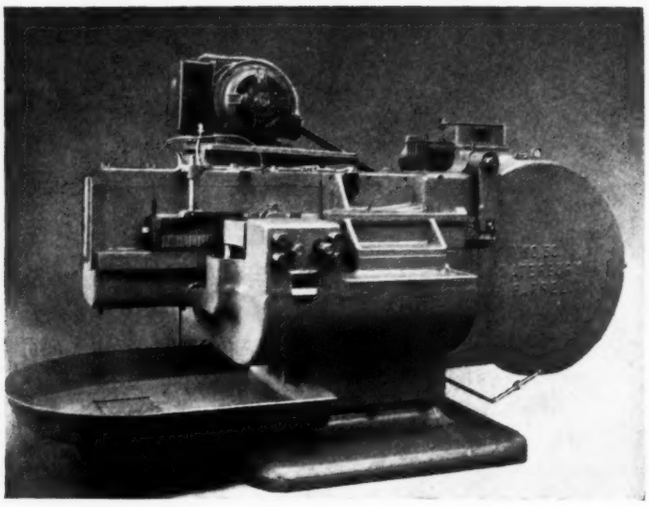


Fig. 2. Waterbury Farrel Horizontal Hand-feed Type Thread-rolling Machine

Waterbury Farrel Thread-Rolling Machines

The line of improved thread-rolling machines now being built by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., includes the four types shown in Figs. 1 to 4. Each of these machines is of the same basic design and is built in several sizes. The work handled by these machines includes bolts, screws, rods, and other parts.

The inclined thread-rolling machine with automatic lift-blade hopper feed, shown in Fig. 1, is built in sizes for threading work of medium length up to and including 1/2 inch in diameter. Although improvements have been made in the entire line of thread-rolling machines, the principal ones apply chiefly to the automatic machine. The wearing surfaces of the reciprocating gate, where it slides in the frame, have been increased in area and provided with a bronze plate. The frame has been extended to the extreme forward edge of the gate, and is made with a removable hardened-steel liner to resist wear and to facilitate repairs or replacements.

The cross-transfer slide which carries the blanks from the lower end of the feed chute to the dies is now operated by a cam and can be manually actuated independently of the reciprocating die by means of a device which prevents starting the slide motion except at the proper time. This makes it impossible to feed more than one blank at a time. The driving pulley is furnished with a shear pin which prevents damage to the dies by causing the machine to stop in the event that a blank becomes improperly located. The motor-driven machines are mounted on pedestals designed to house the motor. The motor is mounted on a swing plate so that its weight serves to maintain the proper tension on the driving belts. All gears are encased to run in oil. An oil reservoir is located above the machine, from which all important bearings are served by sight-feed oilers.

In Fig. 3 is shown the operating side of a 3/8-inch automatic threader with chain hopper feed. The notable feature of this machine is the feed, which is attached to the rear of the standard threader in place of the lift-blade feed. The chain feed is so designed that it can be used to replace the more commonly employed lift-blade feed if desired. It will handle longer and more varied work, including long slender blanks which previously could not be fed automatically. The feed is hinged to the machine, its weight being supported by a floor stand. The hopper is easy to load, and it eliminates awkward lifting.

The blanks are agitated in the hopper by a floating spiral cam, and

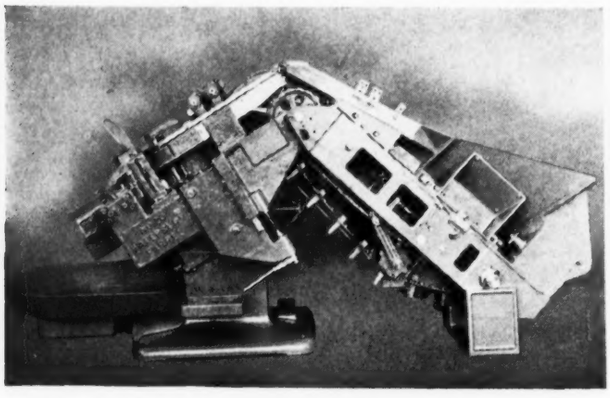


Fig. 3. Automatic Thread-rolling Machine with Chain Hopper Feed

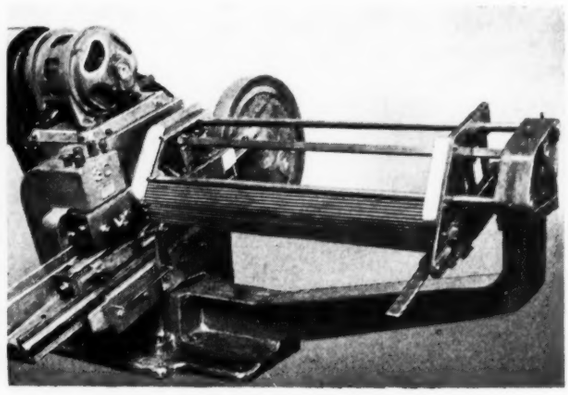


Fig. 4. Thread-rolling Machine Designed to Handle Long Rods

To obtain additional information on equipment described on this page, see lower part of page 156.

are carried up the inclined passageway to the threader feed chute by a series of extending fingers attached to a traveling chain driven by a variable-speed mechanism. The fingers are spaced to feed maximum-length work, and a variable-speed chain drive provides for regulating the feed. A safety device will stop the travel of the chain automatically in case of interference with the free passage of the fingers through the mass of blanks in the hopper, thus preventing breakage. Other mechanical devices assure uninterrupted operation and provide for adapting this type of feed to a wide variety of conditions.

The motor-driven horizontal hand-feed threaders, of the type shown in Fig. 2, are recommended for handling small quantities of work or work that cannot be fed automatically, such as headless blanks, long slender blanks, and unusually short blanks. The work is fed vertically and is assisted in entering the dies by a starter mechanism. Headless work is located vertically against an adjustable depth gage to obtain the correct threaded length. A flat knock-out spring is usually required to flip the threaded work to one side as it leaves the dies. This particular machine has a capacity for threading blanks up to 3/4 inch in diameter.

In the side hand-feed machine shown in Fig. 4, the dies are inclined, and the work—usually long rods—is provided with a supporting table and means for locating the work accurately at right angles to the dies. The rods are fed against a depth gage to give the correct threaded length, and are provided with either an auxiliary stand to support the extending end or with a magazine for stacking the rods, as shown in the illustration. 53

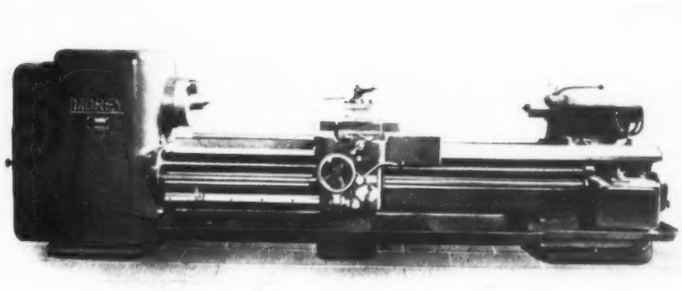


Fig. 1. Morey 27-inch Manufacturing Lathe Designed to Use Tungsten-carbide Tools at Maximum Feeds and Speeds

Morey Manufacturing Lathe, and Deep-Hole Drilling and Reaming Machine

A 27-inch manufacturing lathe built for single-purpose operations and designed for turning at the maximum speeds and feeds that tungsten-carbide tools and other present-day tool steels will permit has been brought out by the Morey Machinery Co., Inc., 410 Broome St., New York City. This machine, shown in Fig. 1, is adapted for efficient handling by non-skilled labor. It is equipped for finger-tip control, and speeds can be selected to suit each individual job. The spindle speed variations are obtained by pick-off gears.

All feeds are hydraulically operated, provision being made for selecting the exact feed for the job. The automatic stops and power traverse are arranged to facilitate operation. Heavy rigid construction is employed to eliminate vibration. The headstock is equipped with Timken bearings, and all other bearings are of the anti-friction type. This machine can be built for a variety of operations by assembling standard units to suit requirements.

The actual swing over the ways is 28 inches; the maximum chuck diameter recommended, 24 inches; swing over carriage slide, 11 inches; the maximum distance between the lathe centers is 60 inches, with a 12-foot bed; hole through spindle, 6 1/4 inches; taper center, Morse No. 6; height from floor to center, 42 inches. For general turning, a 25-H.P. motor with a speed of 1200 to 1800 R.P.M. is recommended, while for heavy-duty turning a 50-H.P. motor with a speed of 1800 R.P.M. is recommended.

A variety of extra equipment is available for use with this lathe, including forming, waving, and boring attachments; square and hexagonal turrets; and shell turning equipment. The weight of the machine with a 12-foot bed is 12,800 pounds, and with a 14-foot bed, 13,950 pounds.

The new Morey 27-inch deep-hole drilling and reaming machine, shown in Fig. 2, is equipped for boring 155-millimeter gun recoil cylinders. It is suitable for drilling, boring, and reaming cylinders of various kinds, as well as gun barrels, and is built in any length to suit specific needs.

Spindle speeds to suit the work are obtained by pick-off gears. Feed and power traverse in both directions are hydraulically operated, and are infinitely variable from 3/8 inch to 75 feet per minute. Two levers control the entire machine. The coolant system is provided with safety devices which instantly stop the machine in case the lubricant supply fails, the drills become dull, or hard spots are encountered in the material. 54

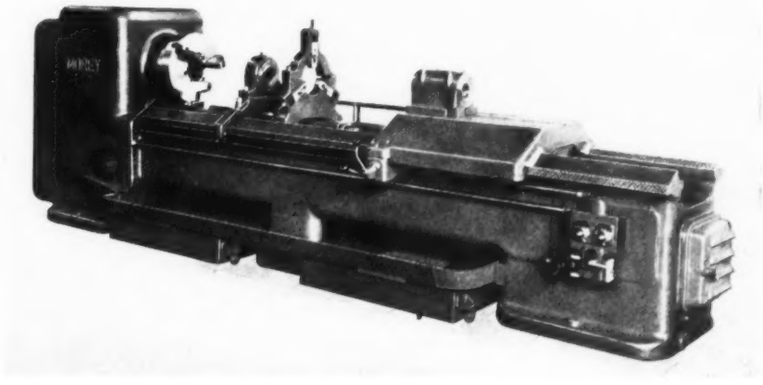


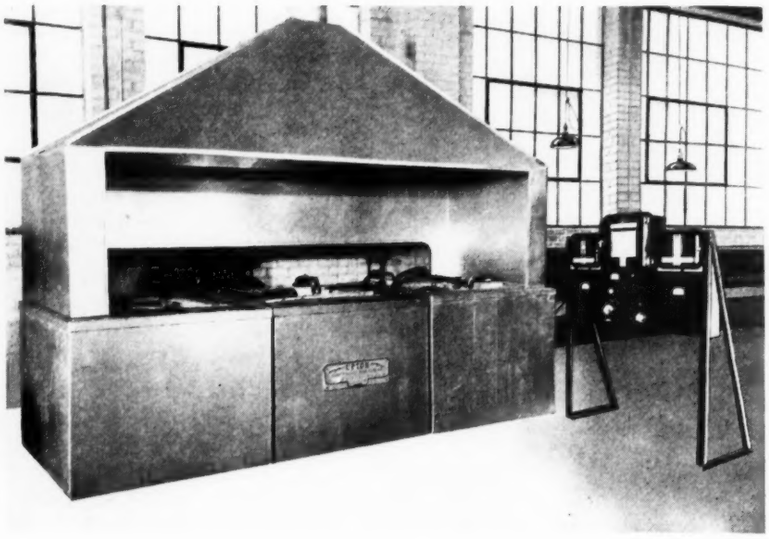
Fig. 2. Morey Deep-hole Drilling and Reaming Machine Equipped for Boring Gun Recoil Cylinders

To obtain additional information on equipment described on this page, see lower part of page 156.

Upton Salt Bath Furnace

An improved type of internally heated electric salt bath furnace, designed on the "electrothermic-permeation" principle to produce more uniform heat, reduce fuel cost, eliminate excessive spoilage of carburizing salts and to provide a ceramic pot that can be guaranteed for at least one year's operation, has been brought out by the Upton Electric Furnace Co., 2211 Grand River, Detroit, Mich.

The new furnace is made in high- and low-temperature styles. The high-temperature style has a special lining of alloy steel insulated on both sides, the interior of the pot itself being lined with two kinds of ceramic brick to withstand abrasion, thermal shock, and corrosion. The low-temperature pot follows the same general design, but does not require the special alloy lining employed in the high-temperature style.

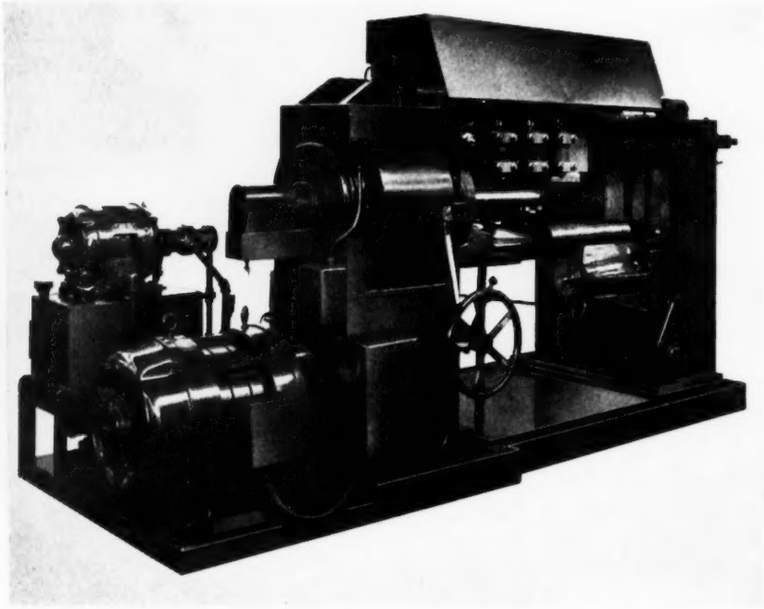


Upton Furnace Consisting of Preheat, High Heat, and Quench Pots with Ceramic Linings, and Recording Type Temperature Controls Selected by the User for Heat-treating High-speed Steel

These furnaces can be used for practically any heating operation requiring temperatures of from 300 to 2500 degrees F. They are available for operations such as carburizing, cyaniding, hardening of molybdenum and tungsten high-speed steels, heating for forging, treating aluminum alloys, tool tipping, etc., in a range of sizes for either batch or continuous operation. 55

Shell-Turning Lathe Designed for High Production

A special shell-turning lathe of unusual design is being offered to munition manufacturers in this country by the Federal Machine and Welder Co., Warren, Ohio. This is not a conventional machine tool, but a special lathe, designed to meet high-production requirements. It was developed by the Britannia Machine Tool Co., Ltd., London, England, prior to the beginning of the war in order to have a machine available for turning out shells in large quantities with unskilled operators.



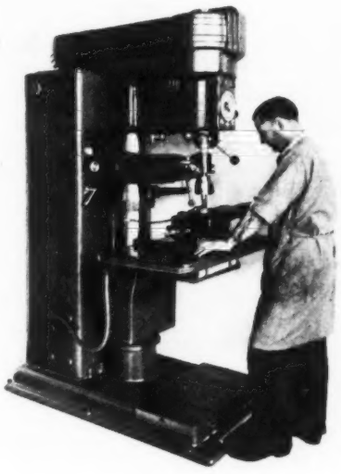
Shell-turning Lathe Placed on the Market by the Federal Machine and Welder Co.

The Federal Machine and Welder Co. has now made arrangements to take over the design of this lathe and manufacture it in this country. From the illustration, it will be noted that many new features are embodied in this lathe, such as tool boxes that are supported from an overhead bridge to permit the chips to fall clear, and a conveyor for loading and unloading the shells, so that they need not be lifted by the operator. The complete machine weighs 26,000 pounds. It is claimed that from eighteen to twenty British 5 1/2-inch shells, 27 inches in length, can be rough-turned per hour on this lathe by unskilled operators. 56

Roller Conveyor for Shells

A concave roller conveyor designed specifically for handling shells between machine shop operations, as well as other cylindrical objects up to 6 inches in diameter, has been brought out by the Standard Conveyor Co., North St. Paul, Minn. The rollers are formed from 2 1/4-inch No. 10 gage tubing. The roller ends are reduced in size and reamed to form a seat for the bearings without separate hubs or cages. The shaft design prevents undue wear, and insures uniformity of the roller carrying surface, even after long service. 57

To obtain additional information on equipment described on this page, see lower part of page 156.



Bakewell No. 2 Precision Tapping Machine

Bakewell Precision Tapping Machines

The precision tapping machine developed by the Bakewell Mfg. Co., 2427 E. 14th St., Los Angeles, Calif., is built in two sizes—Nos. 1 and 2. The No. 1 machine has a capacity for tapping 1/8- to 1/2-inch pipe threads in aluminum, plastics, brass, and magnesium, or 6-32 to 5/8-inch U.S. or N.F. threads in mild steel, employing a driving motor of 1/2 H.P. This machine has a spindle travel of 5 inches.

The No. 2 machine has a capacity for tapping 3/8- to 2-inch pipe threads in aluminum, fiber, plastics, etc., and 3/8- to 1 1/2-inch straight U.S. and N.F. threads in nickel and chromium - molybdenum normalized steel employing a driving motor of 2 H.P. A 1/10-H.P. motor is employed to operate the coolant pumps and a 1/4-H.P. motor is used for the pressure pump. The machine has a spindle travel of 7 inches. Sixteen spindle speeds ranging from 12.4 to 142 R.P.M. are available.

These machines are designed to produce Class 3 fits with No. 1 tolerance precision-ground taps, and Class 4 fits with No. 01 tolerance precision-ground taps. They can be employed to cut internal or external threads. For cutting left-hand threads, it is only necessary to use left-hand lead-screws and reverse the electrical controls by means of the reversing switches with which these machines are equipped.

Upper and lower limit switches, governed by a movable contact, control the traverse of the cutting tool, reversing the motor when the correct depth of thread is reached on the down stroke and when the tool has cleared the work on the up stroke. These operations are all automatic and the tapping depth can be held within precision limits. Touching an "emergency raise" button will immediately retract the spindle at any stage. The solenoid can be made and held inoperative, and the limit switches can be cut out at will. A safety feature designed to prevent tap breakage consists of a specially designed cork-faced clutch, adjustable by means of a compression spring to the torque resistance of the tap. 58

Vernon Universal Tool, Cutter, and Surface Grinder

A combination universal grinder for all types of tool, cutter, and reamer grinding, internal and external, as well as surface grinding, has just been added to the Vernon line of machine tools built by the Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Calif. This machine has several important new features. The motor that carries the grinding wheels swivels through 350 degrees vertically, and the column on which the motor is mounted also swivels through 350 degrees horizontally. Many important advantages not found in conventional machines are offered by this arrangement; for example, the center of the motor and column are positioned to align either cylindrical or surface grinding wheels with the center of the machine bed, thus providing a full grinding range without lengthening the ways.

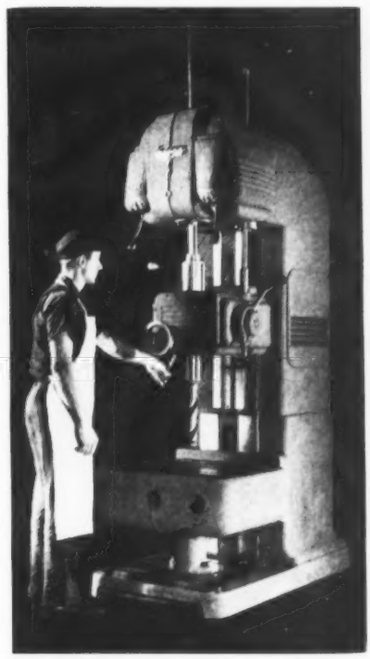
When used as a surface grinder, the machine accommodates a 6- by 10-inch magnetic chuck and will grind a complete area 6 by 16 inches at a height of 7 1/2 inches above the table. The table is traversed by a two-speed wheel, and can be operated from either the front or rear of the machine. Carboloy tools can be ground by tilting the motor and swiveling the column.

The swing of the grinder is 8 inches; the distance between centers, 16 inches; the vertical travel of the motor, 8 inches; the in-and-out travel of the column, 6 inches; and the weight, about 800 pounds. 59

Sibley Drill Press with All-Geared Drive

A new 25-inch swing, all-geared drilling machine has been brought out by the Sibley Machine and Foundry Corporation, South Bend, Ind. Precision accuracy and a rugged design permit this machine to handle fine tool-room and production work, as well as heavy, tough drilling jobs.

Vernon Universal Grinder Built by Machinery Mfg. Co., for Tool, Cutter, and Surface Grinding

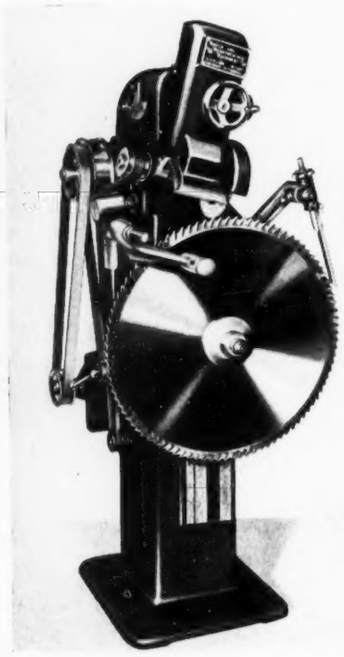


Sibley Drill Press Designed for Precision Tool-room and Production Work

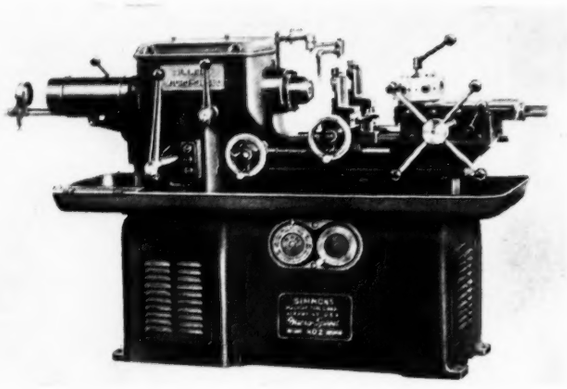
To obtain additional information on equipment described on this page, see lower part of page 156.

Instant change of feeds and speeds is obtained by cam-operated levers within easy reach of the operator. Spindle speeds range from 75 to 1500 R.P.M., and the feeds range from 0.005 to 0.045 inch. The six-spline spindle can be operated either by power or hand feed; the travel by power is 12 inches, and by hand 12 1/2 inches. It takes a No. 4 and a No. 5 Morse taper. All drills are centered within easy reach of the operator to enable him to change over quickly from one job to another. The all-geared drive is obtained through a series of alloy-steel, heat-treated gears mounted on horizontal shafts. The transmission is totally enclosed, but is a complete, removable unit, with the transmission shafts mounted on anti-friction bearings. Multi-spline shafts are used throughout. All gears operate in a bath of oil, providing a smooth powerful drive.

Tapping operations are controlled by electrical reverse switches operating through a starting lever. This drilling machine has an over-all height of 9 feet 6 inches. The maximum distance from the spindle to the base is 33 inches, and the working surface of the table is 18 1/2 by 24 inches. 60



Automatic Saw Grinder Brought out by Motch & Merryweather Machinery Co.



Simmons Back-geared Turret Screw Machine

Simmons "Micro-Speed" Turret Screw Machine

The Simmons Machine Tool Corporation, 1600 N. Broadway, Albany, N. Y., has just brought out a No. 2 "Micro-Speed" turret screw machine equipped with cabinet base and selector dial control. The headstock of this machine is provided with a spindle brake to permit instantaneous stopping under all operating conditions. A large number of spindle speeds are obtainable through the multiple vee driving belts of the Micro-Speed driving unit. The machine is available in plain and back-geared types.

The back-geared type, shown in the illustration, provides spindle speeds ranging from 188 to 750 R.P.M. through the direct drive, and from 44 to 177 R.P.M. with the back-gears engaged. The drive is from a 3-H.P. motor with reversing push-button control. The swing over the bed is 14 inches, and over the cross-slide 6 inches. The width of the bed is 7 inches, and the length of the ways 31 inches. The cross-slide has a longitudinal travel of 12 inches, and a cross travel of 5 inches.

Power feeds for the turret range from 0.006 to 0.457 inch in the back-geared lathe, and from 0.004 to 0.305 inch in the plain type. Tool holes in the hexagon turret are 1 inch in diameter. The automatic chuck has a capacity for handling 1 1/4-inch round bars and 7/8-inch square bars. The back-geared machine weighs 2600 pounds. 61

Motch & Merryweather Saw Grinder and Segmental Saw Blades

The Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland, Ohio, has developed a No. 1 automatic saw grinder for sharpening the segmental saw blades made by this company for use with its Nos. 3 and 4 hydraulic cold-sawing machines. Rigid construction and automatic indexing are features incorporated in this grinder to assure rapid and accurate sharpening of cold saws. The drive, consisting of a single electric motor and belts, is completely enclosed and protected from dust. An oil-pump provides lubricant to all internal moving parts.

The wheel-spindle and wheel-slide are located in the same plane to eliminate overhang and minimize vibration. Accurate spacing or pitch is obtained by an indexing disk. Sliding gears provide a fast speed for grinding fine-pitch teeth and small-diameter saws, and a slow speed for larger saws. Alternate high and low teeth can be ground in one setting by merely positioning a lever on the left-hand side of the machine. All operating controls can be actuated while the grinder is running.

The segmental saw blades recently developed by this company are designed to give high production and long life, with low cutting cost. The tooth pitch can be suited to any material to insure speed and accuracy. Segments of tool steel are fitted to a heat-treated center. These segments project slightly to protect the body of the blade from rubbing. Teeth are ground to a special form designed to afford the most favorable cutting conditions. The segments form a closed ring which stiffens the blade and gives additional strength. After the segmental teeth are completely worn down, new segments can be inserted without any reduction in diameter of the blade, the segments being interchangeable. 62

General Electric Electrode Pressure Gage

An electrode pressure gage designed to measure the pressure between the electrodes of resistance welding machines has been brought out by the General Electric Co., Schenectady, N. Y. The gage can be used either as a standard for check-

To obtain additional information on equipment described on this page, see lower part of page 156.

ing gages or pressure indicators on spot, line, or projection welders, or for checking the electrode pressure at the time of set-up before proceeding with production work. It can also be used by testing laboratories for pressure determinations or by industrial concerns for checking the pressure of various kinds of springs in compression. It measures pressures from 0 up to 4500 pounds. An automatic stop safeguards it against damage if pressures of over 4500 pounds should be applied. 63

Denison 400-Ton Hydraulic Press

A hydraulic press with a cylinder-operated rapid traverse and a cylinder-actuated stripper that operates through the bolster has recently been completed by the Denison Engineering Co., Inc., 102 W. Chestnut St., Columbus, Ohio. The oil reservoir, hydraulic pump and motor, motor starter, electrical controls, and control valves are all assembled within the open or C-type frame. The frame is constructed entirely of welded-steel plate. To obtain the proper working height for the bolster, the press is extended below the floor, as shown in the accompanying illustration.

The main press cylinder has a capacity of 400 tons and a 30-inch stroke. It is single-acting, and has a 36- by 36-inch platen provided with T-slots for clamping the tools in position. Two guide rams, operating in bronze-lined bearings, on each side of the press frame prevent the main ram from rotating. The rapid-traverse or pull-back cylinder is double-acting, and is flange-mounted on the main press cylinder. It has the same stroke and working pressure as the main cylinder, the down speed being 6 feet per minute, and the up speed 10 feet per minute.

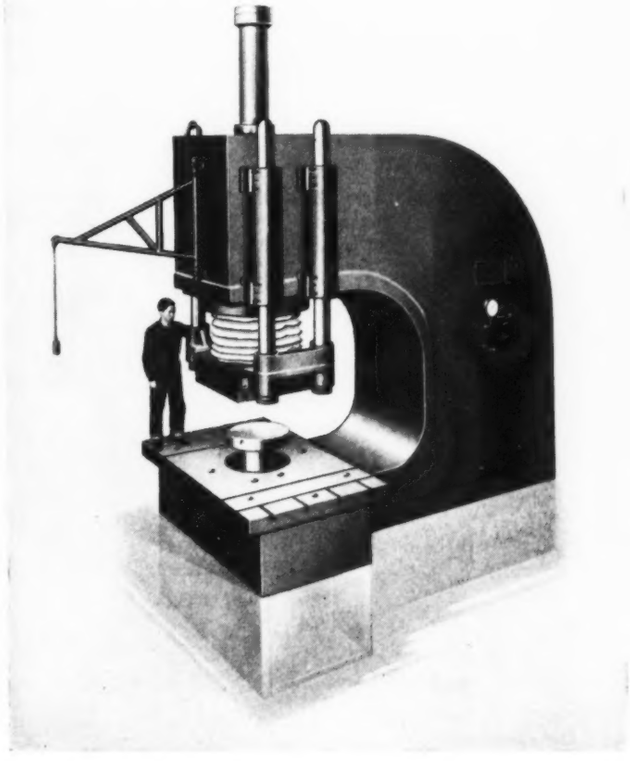
The hydraulic stripper cylinder is double-acting, and is flange-mounted to the sub-bolster in the lower part of the press frame. The upper end of the stripper cylinder ram is machined to facilitate the attachment of bending tools or dies. The stripper ram is protected by a steel cover when not in use.

The bolster is machined to accommodate the stripper cylinder, and is machine-finished all over. It is provided with T-slots for attaching tools. The horizontal surface of the bolster is 60 by 96 inches. A pendent type control station on a swinging bracket extending from the front of the press has push-button control for the main ram, for rapid-traverse speed down, for slow speed down, and for reversing the ram. 64

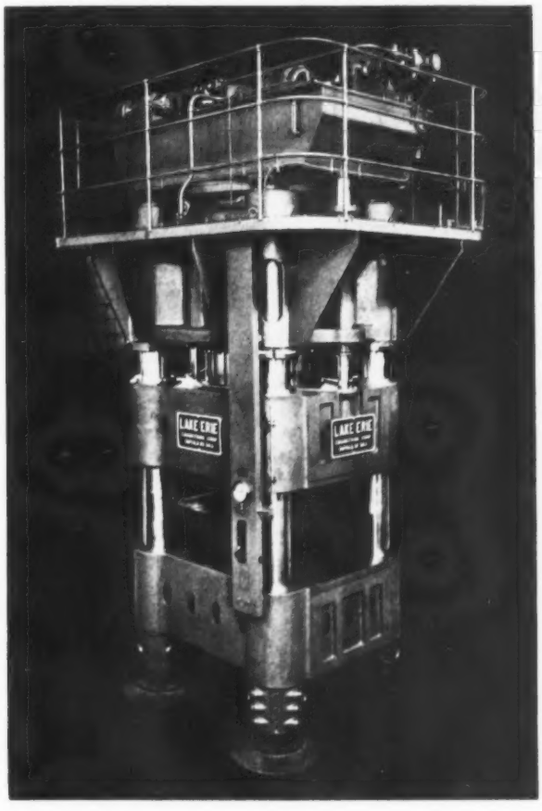
Hydraulic Press of 5000-Ton Capacity Designed for Aircraft Work

A 5000-ton, single-action, hydraulic press furnished with rubber pad and steel bolster, together with automatic motorized loading tables for the high production of aircraft parts, has been built by the Lake Erie Engineering Corporation, Buffalo, N. Y. This press is a self-contained type with the pumping unit located at the top.

The standardized design adapts it for wide applications in the metal-forming field. Advantages claimed are fast operation, low-cost dies, quick change-over of dies, quick handling of stock and finished pieces,



Denison Hydraulic Press Equipped with Cylinder-actuated Stripper which Operates through Bolster



Hydraulic Press Built by Lake Erie Engineering Corporation for Aircraft Work

To obtain additional information on equipment described on this page, see lower part of page 156.

and convenient control of the pressure. Push-button controls are grouped in conveniently located panels. When two or more men are engaged in operating the press, the controls interlock for safety, so that the press cannot be started until the push-buttons on both sides of the press are operated. Controls are provided for starting, stopping, and semi-automatic operation, and inching. Provision is made for adjusting the pressure and length of stroke. 65

Special Holding Device for Threading Shell Caps

A fixture recently developed by the Landis Machine Co., Waynesboro, Pa., provides a means for holding 37-millimeter shell caps in accurate alignment for threading. This special holding device comprises a hardened and ground supporting bushing, a supporting center, and a center-locking member designed to locate and clamp the work.

The shell cap to be threaded is placed on the supporting center in the position shown in the illustration, after which the center is moved forward until the work is seated in the supporting bushing. The work is then locked in place for threading by actuating the center-locking lever. The entire unit is adjustable both horizontally and vertically to assure accurate and permanent alignment of the work with the rotating die-head.

This work-holding fixture for shell caps is designed for use on the Landis 3/4- and 7/8-inch, single- or double-head threading machines. The shape of the parts does not permit gripping on the outside surface, thus making it necessary to employ the socket type fixture and an internally tripped die-head. This equipment eliminates any possibility of the chasers striking the shoulder of the work, and assures threads of uniform length. For work of this kind, it is recommended that the die-head be of the hardened and ground type and also that the machine be equipped with a lead-screw attachment. 66

General Electric Thickness Gage for Non-Magnetic Materials

Recently the General Electric Co., Schenectady, N. Y., developed a gage for magnetic materials that measures thicknesses when applied to one side of a sheet only, as described on page 120 of this number of MACHINERY. This company has also developed on electric gage for measuring the wall thicknesses of hollow aluminum airplane propellers or for making thickness measurements of other non-magnetic metals when only one side is accessible. This gage is applicable even when the non-magnetic metal is backed up by a magnetic metal.

Thicknesses up to 1 1/2 inches, depending upon the electrical resistance of the metal, can be measured to an accuracy of 5 per cent. Brass sheets, copper tanks, and large non-ferrous pipes can be measured in this way. The higher the electrical resistance of the metal, the greater the thickness that can be measured. The gage-head, encased in Bakelite, can be held in one hand for application against the metal. The remainder of the gaging equipment is contained in a steel carrying case and weighs about 30 pounds. 67

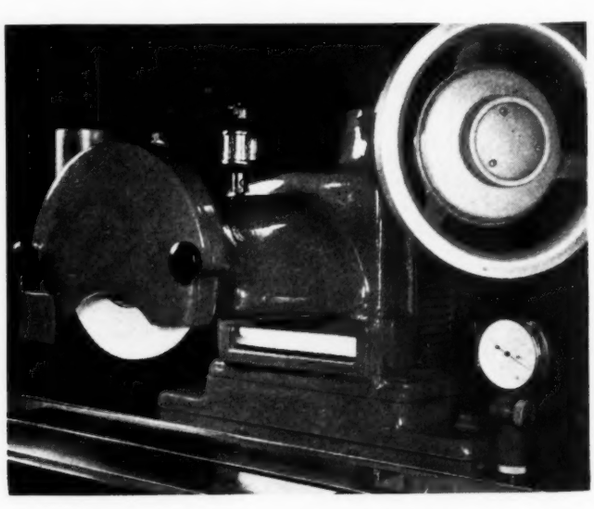
DoAll Precision Surface Grinder

The precision surface grinder recently brought out by Continental Machines, Inc., 1312 S. Washington Ave., Minneapolis, Minn., has incorporated in its design new features developed to meet the rigid standards of accuracy demanded by the Army and the Navy in armament work, which frequently requires a surface to be ground flat to within 0.0001 inch or to 4 micro-inches.

The outstanding feature of this machine is the spindle head. Super-precision ball bearings, carried in a ground, heat-treated, and forged quill of S A E 3140 steel, constitute the most important member of the spindle-head assembly. The spindle hole through the head is lapped to insure an accurate fit.

A built-in flush type light which directs its rays where needed; a dial indicator giving direct measurement between wheel and work to 0.0001 inch; and an adjustable dust or splash guard which can be set close to the work and adjusted as the wheel wears are features of the spindle-head assembly. The wheel guard rotates and can be locked in any position when using a tangent-to-radius wheel-dresser. The hand-

Machine Equipped with Work-holding Device Made by Landis Machine Co. for Threading Shell Caps



Spindle Head of DoAll Precision Surface Grinder Equipped with Built-in Light

To obtain additional information on equipment described on this page, see lower part of page 156.

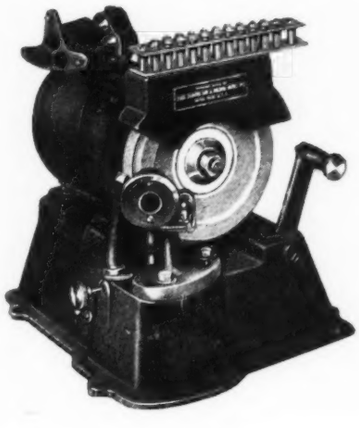
wheel is graduated to 0.0005 inch, and has an auxiliary vernier adjustment for feeding in increments of 0.0001 inch. The handwheel is finished in dull chrome with enamel-filled graduations to prevent rust. The dull chrome finish also makes an ideal surface on which to mark settings with a lead pencil. 68

Improved Line of "Black Diamond" Drill Grinders

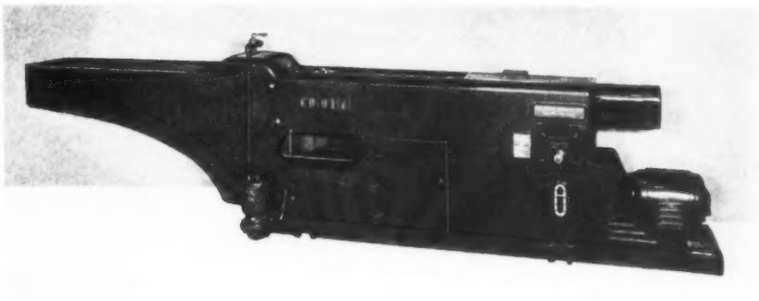
Recent improvements in the line of precision drill grinders made by the Black Diamond Saw & Machine Works, Inc., Natick, Mass., include a web-thinning attachment and a round-bodied motor which replaces the square-housing type previously furnished. The web-thinning attachment provides means for precision-grinding what is known as the "Notched Colton" point on drills, giving just the right amount of grind without weakening the web.

The wheel is of the dry-cutting cup type, and is dressed by a diamond permanently set in a swinging lever that automatically insures correct dressing of the wheel. It is claimed that no mechanical knowledge or skill is necessary to produce accurately ground drill points with these grinders.

The regular Black Diamond drill grinders are made in three capacities, each grinder using a 7-inch cup-wheel with special flange for web-thinning. These three sizes will accommodate drills ranging in size from No. 70 to 3/4 inch in diameter. Each grinder weighs about 90 pounds, and is equipped with a 1/4-H.P., 110- or 220-volt alternating-current motor or a 115- or 230-volt direct-current motor. 69



"Black Diamond" Drill Grinder with Web-thinning Attachment



Colonial Universal Horizontal Broaching Machine

Colonial Improved Horizontal Broaching Machines

New and improved features have been incorporated in a line of universal horizontal broaching machines now being introduced to the trade by the Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich. The machines regularly included in this line range in capacity from 3 tons with a 36-inch stroke up to 25 tons with a 90-inch stroke. Machines of larger capacities, however, are also available on special order. The peak capacities of these machines have been substantially increased over the normal ratings.

The new features include a shock-proof control mechanism designed to prevent impact of the starting lever at each end of the stroke, and a readily accessible and increased vertical adjustment for the drive-head to provide greater flexibility for off-center special broaching set-ups. Provision is made for convenient mounting of spiral broach driving heads.

Improvements in construction include steel tube cylinders with welded joints to prevent leaks and to provide longer life; valves and piping that have been simplified to facilitate accessibility for service; and an integral motor and pump bracket to assure correct alignment between these units, prevent wear, and give longer life with quiet operation. The rigidly constructed chip pan can be used for a broach follow-rest support when required. The chip compartment is readily accessible for the removal of chips. The cross-head has replaceable hard bronze shoes which slide on hardened and ground ways. All machines are equipped with heavy-duty, large-volume coolant pumps. 70

Hammond Carbide-Tool Grinder

A carbide-tool grinder using 6-inch silicon-carbide or diamond wheels has just been placed on the market by Hammond Machinery Builders, Inc., 1619 Douglas Ave., Kalamazoo, Mich. This new machine has been constructed to meet the requirements for the strength and solidarity demanded by present-day production schedules.

The new features include extra-heavy tilting tables that are easily removable without the use of tools to facilitate installation of new wheels; tables slotted for the protractor angle guide furnished with the machine; inside edge of the table machined inward at an angle to permit tilting without readjusting the distance between table and wheel; cast-iron support under each table which serves also as a sludge pan and which can be quickly removed for cleaning; an indicator to insure accuracy in grinding angles ranging from 0 to 25 degrees; and 1/2-H.P. motor of heavy-duty type having a speed of 3450 R.P.M.

The machine accommodates sili-

Hammond Carbide-tool Grinder with Heavy Tilting Tables

To obtain additional information on equipment described on this page, see lower part of page 156.

con-carbide wheels 6 by 1 1/2 by 1 1/4 inches or diamond cup-wheels 6 by 3/4 by 1 1/4 inches. The motor is reversible for right- or left-hand grinding, and is controlled by a conveniently located switch. 71

Hanna Pneumatic Speed Control Valve

A new valve for controlling the forward and reverse speeds of the piston strokes of pneumatically operated cylinders has been developed by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. When installed between the operating valve

Hanna Speed Control Valve

and one end of a cylinder, this valve controls the flow of air acting on one side of the piston. It permits the rate of inflow and the rate of exhaust to be adjusted separately. One valve will, therefore, control the piston speed in two directions. However, for a very sensitive adjustment and accurate control of the piston speed, two control valves, one for each end of the cylinder, are recommended.

The valve is so constructed that the two adjustable orifices which control the air flow in two directions are set before the flow of air begins, thus insuring control from the very start of the movement. The valve body is cadmium-plated, and all other valve parts are made of corrosion-resistant materials. The valve is recommended for 250 pounds maximum air pressure, and is available in 1/8-, 1/4-, 3/8-, 1/2-, 3/4-, and 1-inch pipe sizes. 72

Alco Releasing Type Tap-Holder

A releasing type tap-holder for hand screw machines and turret lathes has just been introduced to

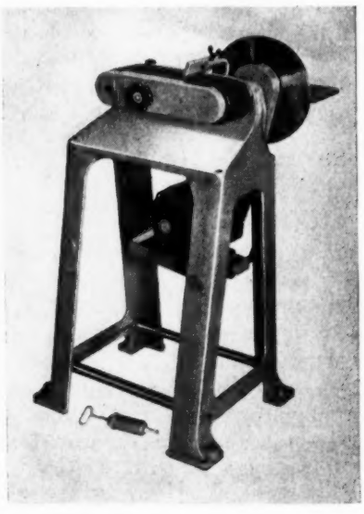
Releasing Type Tap-holder Made by Alco Tool Co.

the trade by the Alco Tool Co., 835 Housatonic Ave., Bridgeport, Conn. Each tap-holder of this new line will hold taps of several sizes within its capacity range, only one wrench being required to tighten the nuts that serve to grip the tap securely in the holder. Both right- and left-hand threads can be cut without any adjustment of the holder. 73

Walls Improved Duplex Grinder

A power-driven, abrasive band and disk grinder known as the "Duplex-M," which permits rough-grinding on the disk and finish-grinding on the abrasive band, has been brought out by the Walls Sales Corporation, 96 Warren St., New York City. This streamline machine is furnished with a heavy-duty 1/2-H.P. motor, fully enclosed V-belt drive, balanced steel pulleys, dustproof ball bearings, and an Alemite lubricating system. A simple adjustment provides for taking up belt slack, and the changing of belts is facilitated by a new tension release.

The band grinding table is 5 by 10

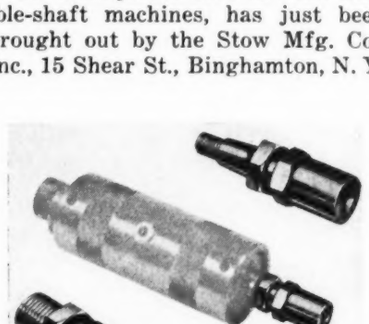


Walls Abrasive Band and Disk Grinder

inches, and the disk grinding table 6 by 12 inches. The abrasive band is 4 by 36 1/4 inches, and the steel disk is 12 inches in diameter. The abrasive band drums are 4 by 4 1/2 inches. The speed is 1450 R.P.M., the weight 300 pounds, and the floor space required 20 by 24 inches. 74

Collet Chuck for Stow Flexible-Shaft Machines

A compact, single-purpose, collet chuck, which can be attached quickly to the hand-pieces used on Stow flexible-shaft machines, has just been brought out by the Stow Mfg. Co., Inc., 15 Shear St., Binghamton, N. Y.



Stow Flexible-shaft Collet Chucks

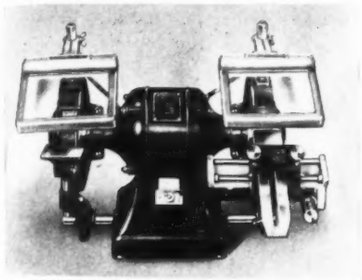
The new unit is furnished in two sizes, one with 1/4-inch and the other with 3/8-inch chucking capacity.

This chuck is made in two styles. In one style, which has a straight-threaded hexagonal-head stud, the collet chuck interchanges with the clamp spindle on the standard hand-piece. In the other style, a tapered shank fits into the tapered socket of the high-speed hand-piece. This type is designed for use with rotary files, mounted points, or other high-speed tools to assure true running on precision work. The tapered type of collet chuck can also be mounted in a toolpost attachment for use in performing grinding operations in a lathe. 75

Stanley Grinder for Sharpening Small Tools

A ball-bearing 1/3-H.P. grinder with 7- by 1-inch wheels has been brought out by the Stanley Electric Tool Division, Stanley Works, New Britain, Conn., equipped with the new Stanley "Flud-Lite" eye shields. The eye shields are connected to the grinder circuit, so that the lights go

To obtain additional information on equipment described on this page, see lower part of page 156.



Small-tool Grinder Built by the Stanley Electrical Tool Division

on or off as the grinder switch is operated.

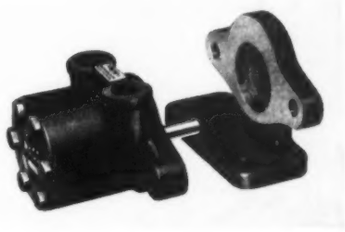
The special motor in this No. 677 grinder operates at the slow speed required to prevent edge tools from having the temper burned out. Two wheels are furnished with the grinder, a special wheel for edge tool grinding and one for general grinding. The wheels are protected with guards and covers, except at the working surface, and have exhaust outlets. The grinder is equipped with a patented plane iron and chisel-grinding attachment with micrometer-screw adjustment. It is available for operation on alternating or direct current, and has a top speed of 1800 R.P.M. 76

Brown Temperature Recording Instrument

The Brown Instrument Co., Wayne and Roberts Aves., Philadelphia, Pa., has developed a new type of self-balancing potentiometer for indicating and recording temperatures on circular charts. This instrument employs the "Null-Point" potentiometer measuring circuit, but its balancing system is entirely new and different from that of previous designs.

The balancing system is continuous and has no galvanometer. An outstanding feature is the speed of response and extreme sensitivity to minute temperature changes. All live parts are enclosed, and all amplifier components are over size. The sensitivity can be adjusted for correct operation on any standard pyrometer range, thus making all amplifiers interchangeable. The reversible brushless balancing motor with built-in gear reduction is totally enclosed, and has ample power for driving the recording pen, pointer, and slide wire. 77

Brown Instrument for Recording Temperatures



B & S Rotary Geared Pump

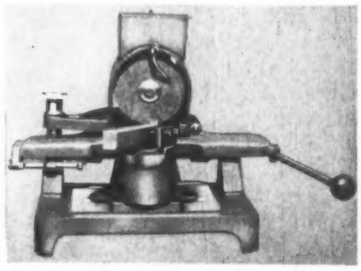
B&S Rotary Geared Pump with Helical Gears

A No. 00 rotary geared pump adapted for supplying oil or coolant at pressures up to 100 pounds per square inch has been added to the line of pumps made by the Brown & Sharpe Mfg. Co., Providence, R. I. The helical gears used in this pump provide smooth, quiet operation at speeds adapted for direct motor drive. The pump is self-lubricating.

The shafts turn directly in the cap and end stand, no separate bearings being used. An oil seal is employed to prevent leakage and to provide for free-turning action. The bearing surfaces of the stand, end cap, and housing are ground with an oil-tight fit and are assembled without gaskets. The flange mounting is designed for direct motor drive and for assembly as an integral part of the machine. The separate foot type mounting bracket adapts the pump for practically any mounting. The pumps can be furnished for operation in either direction. 78

Drafto Chip-Breaker Grinder

The Drafto Co., 182 Walnut St., Cochranton, Pa., is now manufacturing a Model A machine designed for grinding chip-breaker grooves in carbide metal-cutting tools. A vise equipped with a ball adjustment permits setting the tool to any required angle. The tool can be removed for inspection without disturbing the vise.

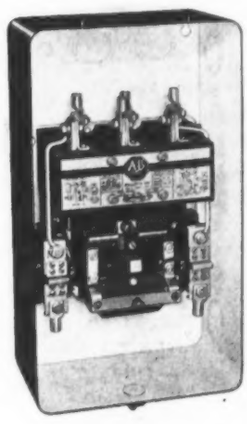


Drafto Machine for Grinding Chip-breaker Grooves in Carbide Tools

The chip groove is made by a diamond cutting wheel mounted on the shaft of a 1/4-H.P. motor operating on 110-volt, 60-cycle current at a speed of 3450 R.P.M. The motor and wheel, mounted on an actuating slide, are moved horizontally to pass the wheel across the tool by means of a hand-lever. The depth of cut is determined by a graduated knob on the motor hinge bracket. Kerosene lubricant from a tank is applied to the wheel by a wick enclosed in a tube. Either 4- or 6-inch diamond wheels can be supplied. 79

Allen-Bradley Large-Size Solenoid Starter

To meet the demand for a larger starter with solenoid switch structure than has previously been available, the Allen-Bradley Co., 1331 S. First St., Milwaukee, Wis., has developed a new Size 4 model desig-



Allen-Bradley Bulletin 709, Size 4, Solenoid Switch

To obtain additional information on equipment described on this page, see lower part of page 156.

nated Bulletin 709. This new solenoid starter, which has a maximum horsepower rating of 50 H.P., 220 volts, and 100 H.P., 440-550-600 volts, will replace the older Bulletin 710 Size 4 clapper starter.

In the new starter, contact cleaning, filing, or dressing is avoided by the use of cadmium-silver contacts. There are no bearings, pivots, or hinges. The double-break, cadmium-silver contacts are totally encased in an arc hood, each pole of the switch having its individual arc chamber which permits the starters to be closely grouped without danger of flashover between switches.

The starter is mounted on a self-insulated metal baseplate which, in turn, can be mounted on any metal surface without extra insulation. It can be provided with or without an enclosure. The enclosed starter is available in the N.E.M.A. types, as well as in various types adapted for use under conditions made hazardous by gases and dust. 80

Dayton Rogers Pneumatic Die Cushions

The Dayton Rogers Mfg. Co., 2830 Thirteenth Ave., S., Minneapolis, Minn., has recently brought out a pneumatic die cushion known as Model CCC. These cushions are furnished in double-tandem units, and are primarily designed for extremely heavy ring-holding pressure on large double-throw, single-crank presses. They are also adapted for use on double-crank, double-throw presses.

The machines are supplied with a combination regulating valve and pressure gage that controls all draw-ring holding pressures. The cylinder section of the pneumatic die cushion is so designed that it automatically shields the working parts of the cushion cylinders, preventing slugs or loose parts from coming in contact with the cushion unit. A pit is usually provided for these larger tandem cushions, which are furnished complete with a remote centralized lubricating block, or header, equipped with leads that carry the lubricant to the individual cushion cylinders. This type of cushion equipment provides ring-holding pressures from 25 to 100 tons, controlled by the automatic regulating valve. 81

Barber-Colman Bench Center for Inspecting Cylindrical Work

Improved Barber-Colman Bench Center

An improved bench center for inspecting a wide variety of small work up to 6 1/2 inches in diameter by 18 inches long is being introduced on the market by the Barber-Colman Co., 203 Loomis St., Rockford, Ill. This bench center is designed to provide an accurate, fast method for inspecting cylinders and circular pieces. The quick-acting lever on the tail-center, when moved to the left, clamps the center, and when moved to the right, unclamps and retracts it, all in one motion.

The center is so designed that heavy work cannot force it back and thus destroy the accuracy of the setting. All three sliding members are located from the same reference surfaces to insure accurate positioning of the sliding indicator base with respect to the centers when these sliding members are located at any position along the bed.

The ways and clamps are designed to insure free-sliding centers and indicator base when these members are unclamped. The slide or indicator base is provided with a vertical post to accommodate a standard type indicator clamp or various types of indicator holders. 82

Dayton Rogers Pneumatic Die Cushion Equipment

Lovejoy Floating-Shaft Coupling

A floating-shaft flexible coupling, designated L-R Type HKQ, has been placed on the market by the Lovejoy Flexible Coupling Co., 5021 W. Lake St., Chicago, Ill. This coupling is applicable to either horizontal or vertical drives, and is recommended for use where the space between the driving and driven units cannot be properly covered by standard couplings, especially when there is excessive misalignment.

An outstanding feature of this coupling is the speed with which it can be disassembled, the operation requiring merely the removal and reversal of three to five driving bolts. This is accomplished without disturbing the machines or connecting units.

Three types of cushions are used in this coupling: "Metalflex"—a long-wearing brake lining material, used where heavy loads are developed at speeds not exceeding 300 R.P.M.; leather load cushions of oak-tanned belting leather for use on sustained loads

To obtain additional information on equipment described on this page, see lower part of page 156.

with infrequent or no cyclic variation; and "Multi-flex" cushions — a vulcanized duck and rubber material for fluctuating loads and for the absorption of vibration and compensation for maximum misalignment. These free-floating load cushions are held in position by a steel retaining collar. The new couplings are made in standard sizes with bores from 1 1/2 to 8 1/2 inches in diameter, and in horsepower ratings of 7 to 800 H.P. at 100 R.P.M. 83

C.W.C. Hexagon-Bed Turret, and Polishing Lathe

A hexagon-bed turret for bench and engine lathes is being placed on the market by the C. W. C. Corporation, Hawthorne, Calif. Several unique automatic features have been incorporated in this new turret, which is shown in Fig. 1. The turret rotates as the slide is drawn back and is automatically locked in position by a tapered pin. The individual stops are also automatically indexed with the turret. The slide is mounted on heavy square guides to obtain maximum bearing surfaces and to provide ample adjustment for wear. The turret is operated by a hand-lever.

Another new product of this company is a high-speed polishing lathe developed to release precision bench lathes for other work. This polishing lathe, shown in Fig. 2, is adapted for finishing turret lathe products, removing tool marks, polishing round parts, and for various lapping and burnishing operations. The collet is designed to hold work having a considerable variation in diameter without requiring readjustment of the collet tension. The draw-tube, being hollow, permits polishing long pieces. 84

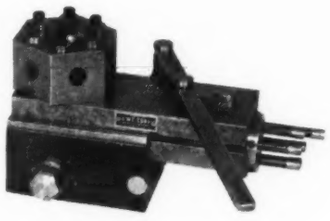


Fig. 1. Hexagon-bed Turret Brought out by the C. W. C. Corporation

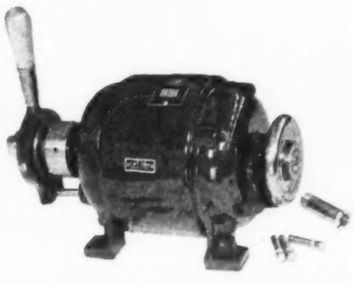


Fig. 2. C. W. C. Polishing Lathe

Pines Horizontal Burring Machines

The Pines Engineering Co., St. Charles, Ill., is placing on the market a horizontal-spindle burring machine which is adapted for reaming, burring, facing, threading, or honing tubing and rods. This machine is equipped with an air-operated work-chuck, controlled by a limit switch which is coordinated with the feed-movement lever that advances the spindle.

Rod and Tube Burring, Reaming, and Threading Machine Made by Pines Engineering Co.

High-speed operation is claimed for this mechanical-electrical arrangement, production being as high as 1200 pieces per hour on some classes of work. With the typical set-up illustrated, three operations are performed in a single pass, the outside diameter of the tube being burred, the end faced, and the inside diameter reamed. Simplicity of set-up, ease of operation, and adaptability for handling a large range of tube or rod sizes are advantages claimed for this new type of machine by the maker. 85

Scherr "Comparitol-Inspectoset" for Checking Measurements up to 8 Inches in Steps of 0.0001 Inch

Scherr "Comparitol-Inspectoset"

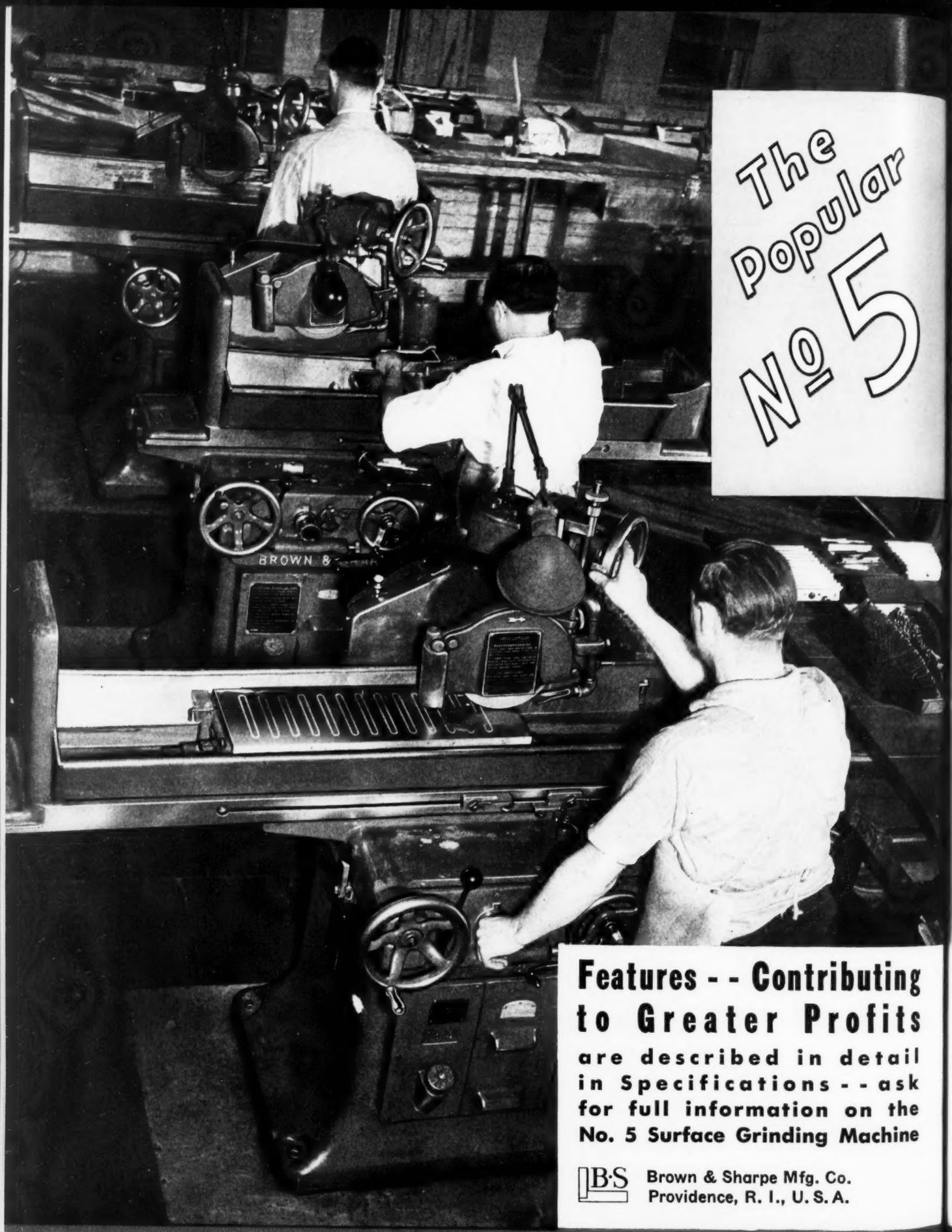
The George Scherr Co., 128 Lafayette St., New York City, has brought out a "Comparitol-Inspectoset" unit designed especially for use in shops engaged in the production of parts to very close tolerances. This new unit provides standards of measurement that enable complete control to be maintained over all shop gages, mass-production parts, ball bearings, pins, etc. It has been developed to assist in eliminating rejections and disputes over measurements and to guarantee precision accuracy in interchangeable manufacture, especially in shops having sub-contracts.

Included in the unit is the Comparitol, which is graduated to read to 0.0001 inch over a range of plus and minus 0.002 inch, and the Ultra-Chex Inspectoset which consists of thirty-four gage-blocks that will make up all combinations in steps of 0.0001 inch from 0.300 to 8 inches. The Inspectoset comes in a specially designed polished case which also holds the other gages of the unit. The Comparitol is first set with the Ultra-Chex in the Inspectoset, after which parts can be checked quickly and easily to 0.0001 inch. 86

Brown Temperature Control for Plating Tanks

The Brown Instrument Co., Wayne and Roberts Aves., Philadelphia, Pa., has developed a new system of temperature control for plating tanks consisting essentially of direct control of the temperature of the water, which is circulated through pipe coils or water jackets, rather than indirect control of the circulating

To obtain additional information on equipment described on this page, see lower part of page 156.



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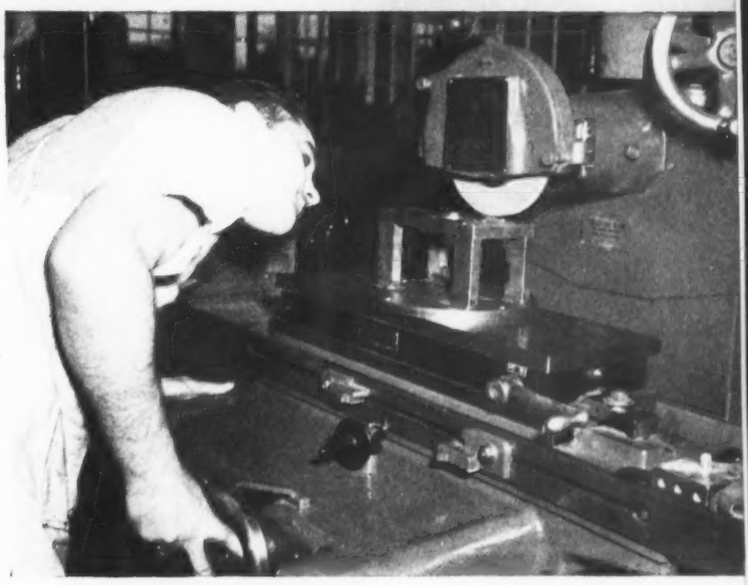
are described in detail in Specifications - - ask for full information on the No. 5 Surface Grinding Machine

B·S Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN &

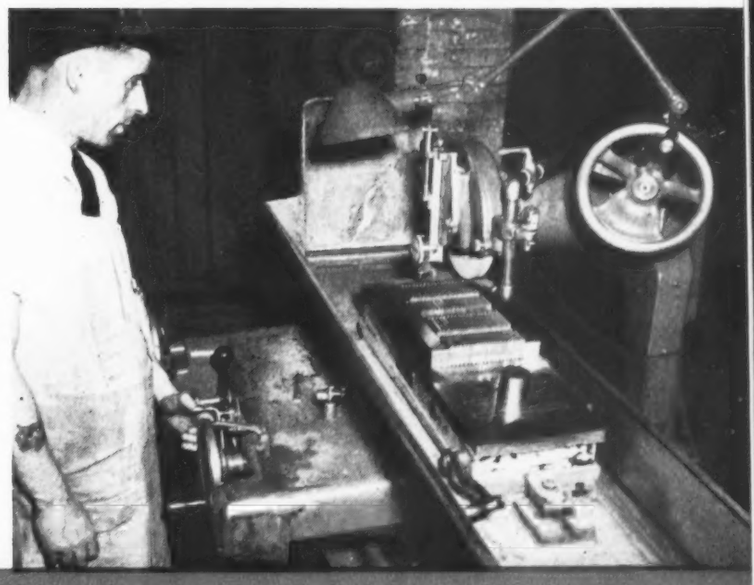
–for Tool Work or Production Grinding

Rapid Set-up and Efficient Operation make it a Favorite with Operators and Management



- Sturdy
- Compact
- Electrically Powered
- Hydraulic Type

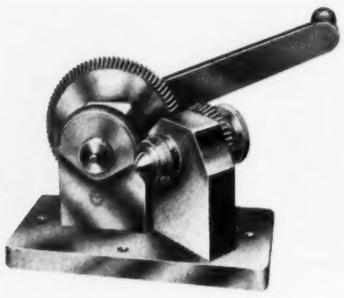
--built to give precision . . . fine finish . . . rapid stock removal on flat surfaces.



SHARPE

water from the temperature of the plating solution.

Plating with such metals as chromium, copper, nickel, and cadmium, for example, is more effectively and economically done if the plating solution is maintained at the temperature best suited to the desired conductivity or "throwing power" of the solution. In maintaining a uniform plating temperature, the new equipment promotes economy, as well as longer life, of the control thermometer. 87



Device for Marking Graduations on Shell Fuses and Time Rings

Device for Marking Graduations on Time Rings and Shell Fuses

A small, compact, time-train ring marking device designed for bench mounting has been developed recently by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa. This device is also suitable for marking graduations on fuses, beveled dials, etc. It is built to suit the work to be handled, each device being made to mark work of but one size and one bevel angle.

Production varies from 100 to 600 markings per hour, depending on the part to be marked. The part-holder shaft runs in an eccentric bushing which can be adjusted to produce marking of the desired depth. Bevel gears at the rear of the device serve to maintain correct peripheral spacing of the marking. The operating handle is so proportioned that the marking can be accomplished without fatigue. 88

* * *

Nickel - chromium - molybdenum steels, which have been used for some time in the principal parts of airplane propeller hubs, are now being used for propeller blades, and are likely to be adopted for many structural parts of planes.

Plastics Find New Uses in Industry

The plastics industry has been asked to increase its production, no less than the metal industries, in order to meet the constantly increasing applications for which various plastic materials are suitable. In considering the application of plastics, it must be remembered that there are a great many different types of plastic materials, differing in physical characteristics. These plastics cannot be used at random. It is necessary to study their suitability to the job in hand. Manufacturers in the plastics industry are well qualified to give expert advice to users.

It is of interest to note that while the use of plastics definitely helps to reduce the difficulties caused by the shortage of other materials, in many instances manufacturers are learning that plastics are better suited to the job than the materials formerly employed. In certain phases of defense work, for example, the use of plastic insulating materials, involving millions of pounds of plastics, will be permanently adopted.

Plastics are not serving just as substitutes; in many cases, they do the job that other materials have definitely failed to do. When applied to distributor heads for automobiles and airplanes, plastics were not adopted as substitutes for other materials; on the contrary, plastics solved a definite problem, and they provide a reliable service over a long period of years. Plastics were not adopted as a substitute for telephone receivers; but because they were superior to materials formerly used.

Today there are plastics that are sufficiently strong and unaffected by water so that such an intricate device as a bilge pump is manufactured from them—pumps that are not affected by electrolytic action and that are immune from corrosion, pumps that will stand up under the hardest wear and tear in service.

Another example of the use of plastics is in sprinkler pipes—not primarily to carry water, but to carry compressed air at a pressure of 150 pounds. If a fire occurs, the sprinkler head "lets go," the air pressure drops, and a mercury switch closes and turns water into the pipes. Engineers have found that plastics, being dielectric, unharmed by water, mercury, or heat, are the only satisfactory materials for meeting the rigid specifications necessary.

From the foregoing, it is clear that plastics will definitely aid in meeting the shortage of other materials, and, more than that, they will, in many instances, do a better job. In the use of plastics, however, it pays to be cautious. In the hands of the inexperienced designer, they have at times proved costly to the manufacturer making use of them; but there are many organizations and men in the plastics industry who can correctly guide a prospective user and point out the limitations of these products, as well as their decided advantages.

In the forming of plastics into finished parts—by compression, injection, or transfer molding—the tools and dies play an important part. Another thing that manufacturers who plan to use plastics must realize is that the change-over from other materials to plastics is not an overnight job; it almost invariably means redesigning, as the physical characteristics of plastics are different from those of the materials that have formerly been used. It should be emphasized that the design of parts or products made from plastics requires care and time.

Plastics will never supersede metals or ceramics, as some are inclined to intimate, any more than rayon will completely replace silk, or paper containers will eliminate glass, but plastics will find many new applications for which they will be permanently used. Through the use of plastics, many remarkable results have been achieved in the past. Their future is equally assured; but they must be approached, not as a cure-all for production difficulties, but as materials with specific properties of their own.

* * *

Blackening Process for Steel Parts

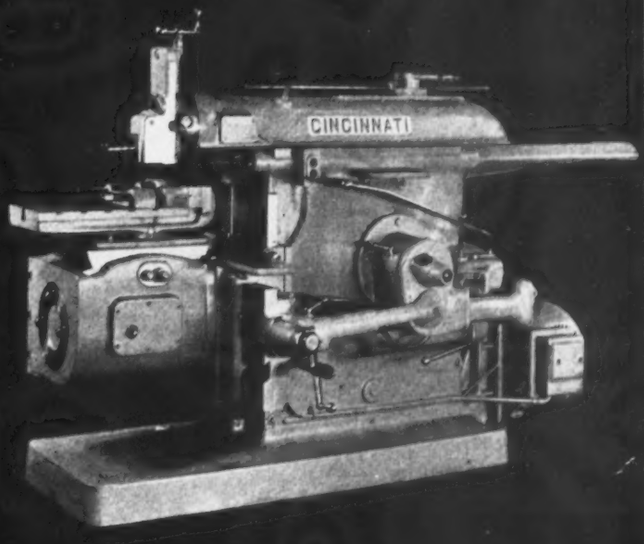
A blackening process for steel parts which is rapid, easily controlled, and produces durable results, has been developed by E. F. Houghton & Co., Philadelphia, Pa. The process makes use of a low-temperature salt known as "Houghto-Black," which is mixed with water and held at the boiling point of the solution (about 290 degrees F.) while the parts to be blackened are dipped into the bath. Only a few minutes immersion is required. The parts should be chemically clean before immersion. A cold and a hot rinse follow the treatment in the bath, after which the parts are ready for assembly. A lustrous black finish results without any change in dimensions.

To obtain additional information on equipment described on this page, see lower part of page 156.

Cincinnati Shaper with Universal Table

With the Universal Table, the work can be set to any angle. Power rapid traverse instantly shifts the table to the right position for the next job. Eight sizes; 16" to 36" stroke.

Write for Catalog N-1



THE CINCINNATI SHAPER CO.

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Bronze-Welding Cast Iron to Steel

An economical procedure for bronze-welding steel to cast iron is used in the fabrication of a certain type of piston ring, according to *Oxy-Acetylene Tips*. This ring has a lug welded to one end in such a way as to act as a tongue to cover the gap in the piston-ring at all times as it expands and contracts against the cylinder wall during the movement of the piston. In bronze-welding the steel lug to the nickel cast-iron ring, the use of a flux containing finely divided spelter results not only in speeding up the tinning action, but also in keeping down to a minimum the amount of rod and flux consumed.

Prior to the present procedure for joining the lug to the ring, several methods of soldering, brazing, and welding with a cast-iron rod had been attempted. Cast iron welding had produced hardened spots which were difficult to machine, while soldering and the method of brazing employed had resulted in an excessive use of rod and heating time. However, by using Oxweld cast iron brazing flux, which, with its low melting-point spelter, overcomes the tendency of a nickel-iron base metal to resist the bronze-welding action, and Oxweld 25M bronze welding rod, the operating time per ring, which was formerly 3 to 5 minutes, was reduced to 28 seconds. Only 1 inch of 1/8-inch rod and a small amount of flux are required per ring.

Such a bronze weld has a greater strength than that of the cast-iron base metal, and the bronze strip which is left on the outside of the finished lug provides a better wearing surface than the cast iron. Moreover, the excess bronze deposit is easily machined off.

* * *

American Foundrymen's Meeting

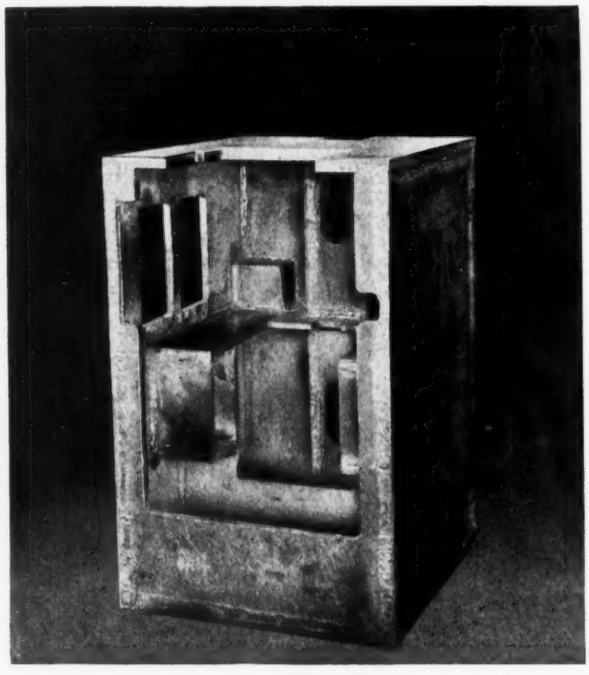
The forty-fifth annual convention of the American Foundrymen's Association was held at the Hotel Pennsylvania, New York City, May 12 to 15. At this meeting, almost every phase of foundry work and pattern-making was discussed in one or more papers. Considerable attention was given to sand control and foundry refractories. Separate sessions were held on gray iron, steel, malleable iron, and non-ferrous foundry practice, as well as on patternmaking. Foundry costs, foundry safety, and job evaluation and time study were other subjects to which separate sessions were devoted. A symposium on apprentice training served to record a great deal of useful information on this subject, and foreman training also received attention.

Teamwork in Industry

War in industry has cost Americans three million dollars a day. It can sabotage any rearmament program. It can cripple a nation before an army gets into the field. France failed in the factory before she failed at the front. Her people forgot how to pull together. Employers refused to sacrifice. Men refused to work. In her zero hour, desperation was no substitute for preparation. She was lost. America must win the battle of industrial cooperation if she is to be secure. Every man has a part. Every worker, every employer, every labor leader.

"If we perspired more in time of peace, we would bleed less in time of war," said General Chiang Kai-shek. Americans know how to work; but we must work harder. America is like a car hitting on half its cylinders—and there is a steep hill ahead. Much of her power is wasted. Waste in the factory, waste on the land. Waste of time, waste of money, waste of men. Friction between men slows up work more than friction in machines.

The defense of the nation demands that all rise above self-interest. It means that we join forces for the common good. Then our industries will run at capacity. Together we will all produce the materials and morale to make America strong.—From *"You Can Defend America."*



Just Fifteen Hours was Required to Produce—with Welding—This Rather Complicated 1600-pound Machine Base, Fabricated by the Menna Welding Co., Toledo, Ohio. According to the General Electric Co., the Expense of Making the Complex Pattern and Mold to Produce This as a Single Casting would have Made the Cost Prohibitive for the Purpose

PROFITABLE MODERNIZING

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THE SUPER SERVICE RADIAL

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The convenience and sound design of the SUPER SERVICE Radial Drilling Machine facilitate faster production, safer operation, and a long life.

For your analysis of the SUPER SERVICE Radial's points of superiority, send for Bulletin R-24 that explains, point by point, the construction and production advantages of this machine. In this bulletin you will learn how 36 speeds and 18 feeds are obtained with only 17 gears, why there is less manipulation and more time for drilling, the advantages of constant speed driving motor, and many more outstanding qualities of the SUPER SERVICE Radial Drilling Machine.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY, CINCINNATI, OHIO, U. S. A.

NEWS OF THE INDUSTRY

Illinois and Indiana

WILFRED SYKES was elected president of the Inland Steel Co., Chicago, Ill., at a recent meeting of the board of directors, succeeding PHILIP D. BLOCK. MR. BLOCK, who has been president of the company for the last twenty-two years, was elected chairman of the executive committee. L. E. BLOCK, who previously served as chairman of the board, was elected chairman of the finance committee. JAMES H. WALSH was elected vice-president in charge of steel works. EDWARD L. RYERSON, chairman of the board, and all the other officers of the company were re-elected.

Philip D. Block, Newly Elected Chairman of the Executive Committee of the Inland Steel Co.

Wilfred Sykes, Who Succeeds Mr. Block as President of the Inland Steel Co.

James H. Walsh, Vice-President in Charge of Steel Works of the Inland Steel Co.

NATIONAL ENGINEERING CO., 549 W. Washington Blvd., Chicago, Ill., has appointed BARNEY CASTOR, 1071 N. Chester Ave., Pasadena, Calif., direct factory representative responsible for the sale and service of Simpson mixers and other foundry equipment made by the company.

C. H. MATSON, formerly general superintendent of the Fort Wayne Works of the General Electric Co., Fort Wayne, Ind., has been appointed assistant manager; R. H. CHADWICK has become assistant to the manager in charge of engineering at the Fort Wayne Works; and E. J. THOMAS has been appointed engineer of the specialty transformer department at the same plant.

R. B. Nichols, New Vice-president and General Manager of the Bantam Bearings Corporation

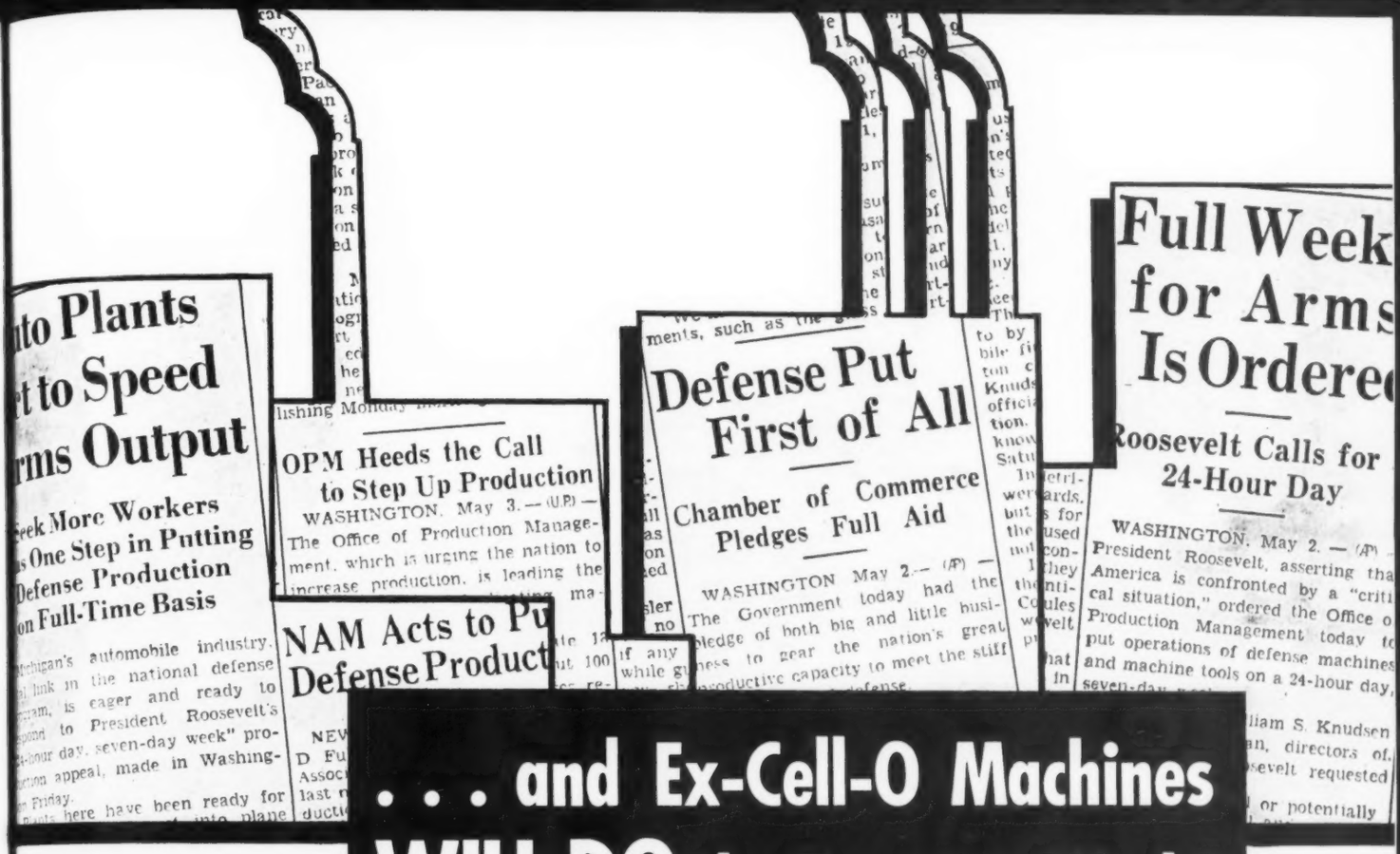
J. Frank Ochlhoffen, Newly Appointed Sales Manager of Bantam Bearings Corporation

R. B. NICHOLS, formerly secretary of the Bantam Bearings Corporation, South Bend, Ind., has been made vice-president and general manager, succeeding A. H. FRAUENTHAL, who recently resigned to organize the KAYDON ENGINEERING CORPORATION in Muskegon, Mich. The new corporation will manufacture large special type roller and ball bearings, as well as aircraft parts. J. FRANK OEHLHOFFEN, assistant sales manager of the Bantam Bearings Corporation, has been advanced to the position of sales manager of the company.

Michigan and Wisconsin

GEORGE EGLINTON, vice-president and general manager of the Lincoln Park Tool and Gage Co., Lincoln Park, Mich., resigned May 1, and will be succeeded by LAWRENCE W. HOWE, who has been associated with the company in executive sales and engineering capacities for the last five years. Mr. Eglinton is now vice-president and director of sales of Charlesworth, Inc., 3900 Terminal Bldg., Cleveland, Ohio.

DETROIT BALL BEARING CO., 110 W. Alexandrine Ave., Detroit, Mich., has



. . . and Ex-Cell-O Machines WILL DO the Precision Work!

WITH their continuous operation the imperative demand of the day, the machine tools of the nation's industry must now really "take it." Day and night they must produce to the utmost—with unfailing accuracy. . . . Ex-Cell-O machines are built for just this kind of a job—for the most exacting type of precision work under high and steady production. Every Ex-Cell-O product—machines and tools for boring, turning, facing, for thread grinding, for lapping, for carbide tool grinding, for many other machining operations—represents the soundest engineering design, the most expert workmanship, the finest practical materials, a combination that has made the name Ex-Cell-O a familiar and outstanding one in every industry where accuracy and speed are essential in the production of metal parts. This is why manufacturers depending upon Ex-Cell-O machines in their plants under the nation's accelerated defense program are assured of maximum productivity.

EX-CELL-O CORPORATION • DETROIT, MICH.

XLO

Precision **THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, GRINDING SPINDLES, HYDRAULIC POWER UNITS, DIESEL INJECTOR PUMPS, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, ETC.**

established a new branch at 127 South Water St., Saginaw, Mich., where a complete stock of ball and roller bearings will be maintained. W. C. THOMPSON, manager of the Saginaw branch, was formerly in charge of the Grand Rapids branch, where he will be succeeded by E. J. MOORE.

HOWARD M. DAWSON, of the Cleveland office of the JESSOP STEEL CO., Washington, Pa., has been transferred to the Detroit office. D. J. HANNA is branch manager of the new Detroit warehouse and office at Woodbridge and Walker Sts.

L. CLAYTON HILL has been appointed vice-president and general manager of the Murray Corporation of America, Detroit, Mich. He was previously vice-president in charge of all manufacturing activities.

ERVIN MANSKE has been appointed general traffic manager of the Allis-Chalmers Mfg. Co.'s eight plants, with headquarters in Milwaukee, Wis. Mr. Manske started work with the company in 1910 as a stenographer in the shipping department. Since 1929, he has been assistant general traffic manager under the late Frederick C. Bryan, whom he now succeeds. CARL J. KRAUS, traffic manager at the Springfield, Ill., plant of the company, has been appointed assistant general traffic manager, and has been transferred to Milwaukee.

New England

GLEN T. LAMPTON has been appointed assistant engineer in charge of experimental engineering of the Hamilton Standard Propellers Division of the United Aircraft Corporation, East Hartford, Conn. The development engineering section of the company will be headed by MURRAY C. BEEBE.

JAMES R. WHITE has been appointed director of sales of the Clover Mfg. Co., Norwalk, Conn., manufacturer of coated abrasives and lapping compounds. He was previously president of Rickard & Co., Inc., New York City, industrial advertising agency.

RAY J. THOMPSON, eastern district manager of Ampco Metal, Inc., Milwaukee, Wis., has changed his address to 57 White Ave., West Hartford, Conn.

GENERAL MACHINERY CORPORATION, 140 Federal St., Boston, Mass., has acquired the manufacturing rights for the Barnes precision cutter-grinder from the estate of William O. Barnes, Worcester, Mass., and is having the machine built by another concern. This machine is designed especially for sharpening formed milling cutters such as are used by manufacturers of rifles, pistols, etc.

New York and New Jersey

HARDINGE BROTHERS, INC., Elmira, N. Y., announces that the name MORRISON MACHINE PRODUCTS DIVISION OF HARDINGE BROTHERS, INC., has been discontinued. All business will be carried on under the name of Hardinge Brothers, Inc. This consolidation is for the benefit of the customers of both divisions, since the business will now be conducted under one firm name in the handling of correspondence, shipments, and in the carrying of accounts.

JAMES D. REDDING, formerly assistant chief of the Aircraft Airworthiness Section of the Civil Aeronautics Administration, has joined the headquarters staff of the Society of Automotive Engineers, 29 W. 39th St., New York City. Mr. Redding will be in charge of the Society's aeronautical activities, including the expanded standardization work in that field.

HUNTER ELECTRO-COPYIST, INC., Syracuse, N. Y., manufacturer of photocopying machines and sensitized papers and linens, has recently moved into new quarters in the Duguid Building, 428 S. Warren St., Syracuse, N. Y., where it will have double the floor space formerly available.

ATLANTIC INSTRUMENT & TOOL CO., INC., 416 Broome St., New York City, has recently been organized to manufacture precision measuring instruments, adjustable snap-gages, and other tools. In addition, the company maintains a department for special work that can be produced on fine precision lathes.

J. M. HOWELL, executive assistant to E. D. Spicer, manager of the Schenectady Works of the General Electric Co., has been named successor to Mr. Spicer, who has been advanced to the post of assistant to the vice-president in charge of manufacturing.

THOMAS L. HARDING has been appointed works manager for the new Red Bank, N. J., Division of the Bendix Aviation Corporation. He has been connected with the company for twenty-three years, having previously been associated with the Eclipse Aviation Division in Bendix, N. J., and the Bendix Radio Corporation.

Ohio

LEMPCO PRODUCTS, INC., Bedford, Ohio, has started construction on a large addition to its plant which, when completed, will increase the equipment assembly facilities 200 per cent and the office space 100 per cent. Besides a complete line of automotive service equipment, the company is now also engaged in manufacturing machine tools, such as crankshaft grinders, surface grinders, electric and hydraulic presses, and external and internal grinders.

F. F. SEAMAN, general manager of Robbins & Myers, Inc., Hoist and Crane Division, Springfield, Ohio, was elected chairman of the Electric Hoist Manufacturers Association at the twenty-fourth annual meeting, held in New York on May 2. Mr. Seaman succeeds H. S. STROUSE of the Harnischfeger Corporation, Milwaukee, Wis. A. S. WATSON, vice-president of the Detroit Hoist & Machine Co., Detroit, Mich., was elected vice-chairman.

R. S. MARTHENS, formerly manager of the Gearing Division of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed staff assistant to the manager of the Canton Ordnance Division. The Canton plant, which is under construction at present, will be operated by the Westinghouse company and owned by the United States Government. Mr. Marthens is widely known in industrial circles, having been active in the work of the American Gear Manufacturers' Association, of which he was treasurer in 1939-1940.

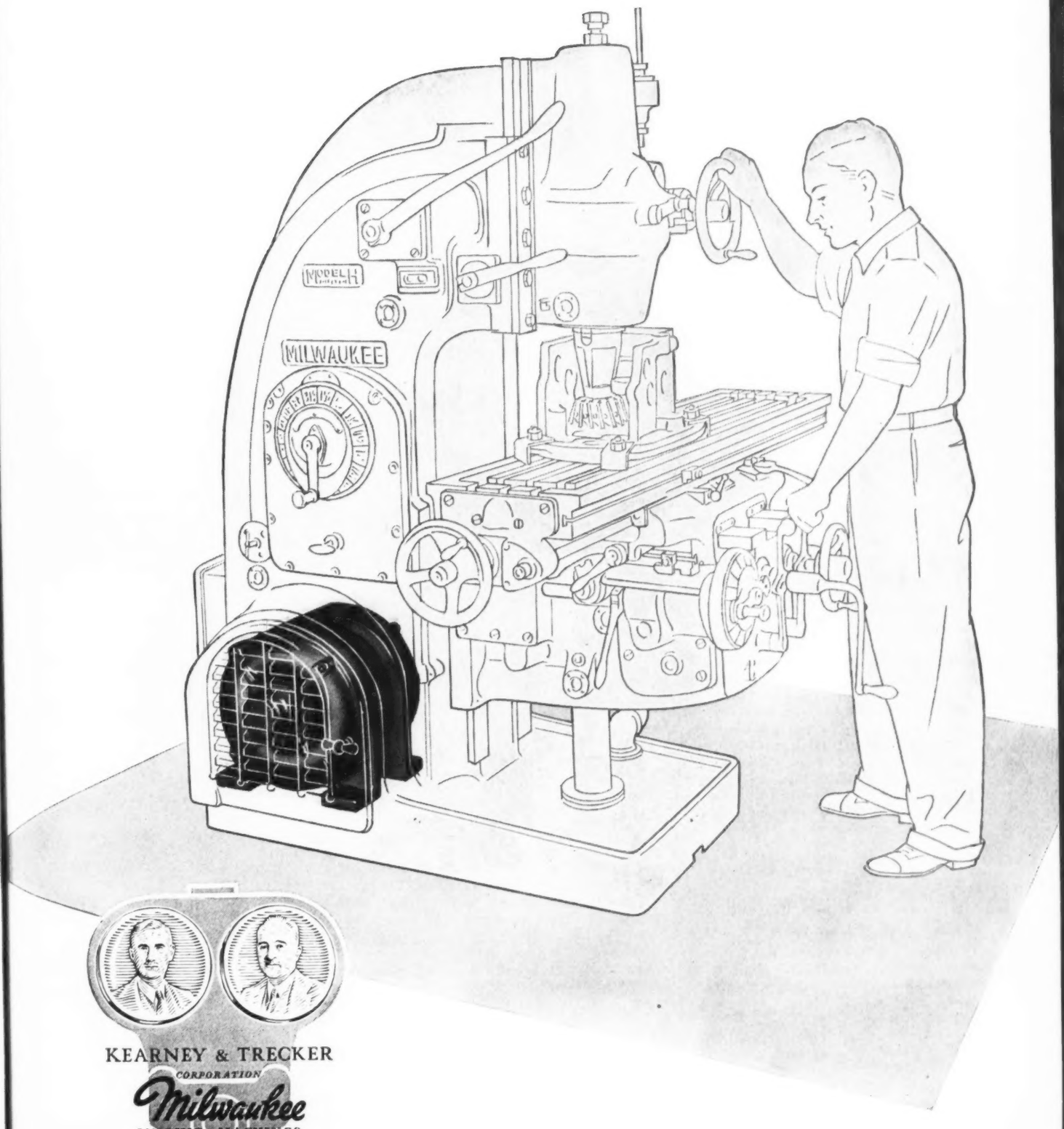
R. S. Marthens, Staff Assistant to the Manager of the Canton Ordnance Division

HPL MFG. CO., 2015 E. 65th St., Cleveland, Ohio, has recently been organized to engage in the production of stampings in small quantities, ranging from 25 to 5000 pieces. Metal, fiber, and other sheet materials will be fabricated. The company has been established by RAY HEDBERG, KERMIT PETERSON, and MELVIN LORENTZ, who have been associated with the small-lot stamping industry in Minneapolis for eleven years.

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, Ohio, has removed its New York sales offices from 50 Church St. to Newark, N. J., 15 Washington St.

Cross-mounting of the motor contributes substantially to the rigidity of Milwaukee Milling Machines and assures a smooth, vibration-free flow of power at all speeds and feeds. Side-mounting permits machine to be placed back-to-wall.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.



KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

MILWAUKEE MILLING MACHINES

Pennsylvania

PANGBORN CORPORATION, Hagerstown, Md., manufacturer of blast cleaning and dust collecting equipment, announces that the Philadelphia office of the corporation is now located at 901 Beury Bldg., 3701 N. Broad St. FORREST G. SHARPE, formerly assistant to the sales manager, has been appointed Philadelphia sales engineer to fill the vacancy caused by the sudden death on April 14 of William T. Randall.

VANADIUM-ALLOYS STEEL CO., Latrobe, Pa., announces a grant to all American tool steel makers and tool manufacturers of the right to manufacture and use, during the national defense period, without payment of royalties, the patented molybdenum high-speed steel made by this company under the trade name of "Van Lom."

A. M. BYERS CO., Pittsburgh, Pa., is entering the field of alloy steel manufacture. It is expected that the company will produce from 30,000 to 40,000 tons of alloy steel annually. Among the initial products will be billets and bars for alloy steel fabricators.

ROLLER-SMITH CO., Bethlehem, Pa., announces the appointment of W. R. SWOISH as vice-president in charge of sales, and JAMES E. BEVAN as vice-president in charge of manufacturing operations.

* * *

Bright Copper-Plating Process for Saving Nickel

A new bright copper-plating process has been developed by Dr. Louis Weisberg, 71 W. 45th St., New York City. The Hanson-Van Winkle-Munning Co., Matawan, N. J., acts as selling agent for the process. This new development is of importance due to the shortage of nickel caused by the Defense Program. Many concerns using heavy nickel plating are contemplating changing to heavy copper deposits followed by light nickel deposits as a means of economizing on nickel. The new process will prove advantageous in this connection.

* * *

New Electrical Journal

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces a new quarterly journal of engineering information known as *The Westinghouse Engineer*, which will contain articles devoted to all phases of practical engineering encountered in the selection, application, operation, and maintenance of electrical equipment. It will be distributed to a selected list of engineers and executives of firms using electric power and equipment. The magazine will also be available by subscription.

OBITUARIES

George R. Munschauer

George R. Munschauer, president of the Niagara Machine & Tool Works, Buffalo, N. Y., died April 24 at the age of sixty-one years, after an illness of three months. Mr. Munschauer had been associated with the Niagara Machine & Tool Works for forty-four years and served as its president for twenty-three years. In addition to being president of the Niagara Machine & Tool Works, he was treasurer of Heinz & Munschauer, Buffalo, manufacturers of electric refrigerators.

Mr. Munschauer is survived by two brothers, Frederick E. and Edwin A.; by two sons, Charles V. and Robert J.; and a daughter, Mrs. Reid S. Moule.

Francis Edwin Brown

Francis Edwin Brown, chairman of David Brown & Sons, Ltd., Meltham (Huddersfield), England, and well known throughout the engineering industry in many parts of the world, died recently at his home in Somerfield, Holmfirth, near Huddersfield. Mr. Brown was sixty-seven years of age. He first joined the company, which was founded by his father in 1860, as an apprentice in January, 1889, and the present business of the company was originated by him.

Mr. Brown was a pioneer in the development of machine-cut gearing. This led to the acquisition of the site of the present Huddersfield Works in 1900 where gearing for all types of machinery was produced. The wide use that is now made of worm-gearing is due in no small measure to his initiative, and he was responsible for much research work on helical gears and the equipment for producing them. The firm also developed special machinery for cutting gears.

In his determination to keep in the van of progress, Mr. Brown made many trips overseas to study American and Continental methods of manufacture. This led to a valuable interchange of ideas; and in about 1912, he concluded an arrangement with the Timken-Detroit Axle Co. to manufacture David Brown worm-gears in the United States for the rear-axle drives of American vehicles. Many of the company's special-purpose machines for worm-gear production were exported to this country for the purpose.

All matters relating to the welfare of workers were advocated by him with the tenacity of purpose typical of his whole business life, and he associated himself with technical training schemes for the younger employes. He was wholeheartedly behind national efforts, and in the crises of 1914 and 1939, the

Francis E. Brown

companies under his direction spared no pains to make their maximum contribution to the country's struggle.

Mr. Brown is survived by his son, David Brown, managing director of the David Brown Group of Companies.

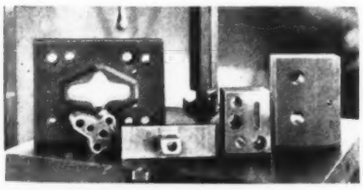
WILLIAM T. RANDALL, Philadelphia sales engineer of the Pangborn Corporation, Hagerstown, Md., died suddenly on April 14 of a heart attack while on a visit to his summer cottage in Pittsfield, Vt. He was fifty-seven years old. Mr. Randall joined the Pangborn Corporation as Philadelphia representative in 1919, and has been widely known throughout that district during the last twenty-two years.

J. WATSON OWINGS, metallurgist on the staff of the Meehanite Metal Corporation, Pittsburgh, Pa., died recently in Spokane, Wash. Mr. Owings had been with the company since 1936, and had spent his entire business career in the foundry industry. He was fifty-six years old.

DoAll Works like Magic

AT GONDA ENGINEERING CO. SALEM, OHIO

8 HOUR JOB IN 1½ HOURS
Drill Fixture cut from a solid piece in less than 1/5 former time. Note, slug is salvaged.



20 HOURS' WORK IN 6 HOURS
By former method of drilling, slotting, shaping and milling, these parts would have taken 20 hours. DoAll did it in 1/3 this time.

DO-ALL Contour Machine BAND SAWING BAND FILING BAND POLISHING

FREE—Literature and technical data on Contour Machining.

The parts shown above were cut in one eight-hour day on the DoAll. At least five days would have been required by drilling, shaping, milling and boring.

The DoAll enables Gonda to make excellent deliveries to their customers; also releases the other machines for work more suited to them.

Today every plant where metal is used, needs the DoAll Contour Machine to get work through on schedule.

One of our factory trained men will call at your plant to show you what a DoAll can save for you. Don't delay—Write today!

BAND FILER

Does faster, better, smoother continuous filing on all materials from high-carbon steel to brass, wood, etc. Your choice of 23 styles of file bands, ½", ⅜" and ¼" wide, flat, oval or half round.

DoALL GRINDER

A super precision surface grinder—a real production tool. Less vibration because motor is built right on the ball-bearing spindle. Work table has exceptionally large bearing surface. Hydraulic table travel is infinitely variable, up to 50 f.p.m.

CONTINENTAL MACHINES, Inc.

1312 S. Washington Ave., Minneapolis, Minn.

Associated with the DoAll Co., Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines

COMING EVENTS

JUNE 1-6—Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Greenbrier Hotel, White Sulphur Springs, W. Va. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

JUNE 12-14—Thirteenth semi-annual meeting of the EASTERN PHOTOELASTICITY CONFERENCE at Cambridge, Mass., under the auspices of the Department of Mechanical Engineering at the Massachusetts Institute of Technology. Chairman of the local committee, W. M. Murray, Room 1-321, Massachusetts Institute of Technology, Cambridge.

JUNE 16-20—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Kansas City, Mo. C. E. Davies, secretary, 29 W. 39th St., New York City.

JUNE 23-27—Forty-fourth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS to be held at the Palmer House, Chicago, Ill., in conjunction with an exhibit of testing apparatus and related equipment. For further information, address the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

JULY 23-26—Twenty-fourth INDUSTRIAL CONFERENCE to be held at Silver Bay, on Lake George, N. Y. E. H. T. Foster, executive secretary, 347 Madison Ave., New York City.

SEPTEMBER 17-19—Annual conference of the NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION at the Royal York Hotel, Toronto, Canada. For additional information, address National Industrial Advertisers Association, Inc., 100 E. Ohio St., Chicago, Ill.

OCTOBER 6-11—EXPOSITION OF POWER AND MECHANICAL ENGINEERING at the International Amphitheatre, Chicago, Ill. For further information, address Charles F. Roth, manager, Grand Central Palace, New York City.

OCTOBER 12-15—Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Louisville, Ky. C. E. Davies, secretary, 29 W. 39th St., New York City.

OCTOBER 16-18—Semi-annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS at the Royal York Hotel, Toronto, Canada. Ford R. Lamb, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

OCTOBER 20-24—Twenty-third NATIONAL METAL CONGRESS AND EXPOSITION to be held in Convention Hall and Commercial Museum, Philadelphia, Pa. Further information can be obtained from W. H. Eisenman, secretary, American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

OCTOBER 30-NOVEMBER 1—National Aircraft Production Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Biltmore Hotel, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

DECEMBER 1-5—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Astor, New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

NEW BOOKS AND PUBLICATIONS

FLIGHT (Two volumes). Published by the American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Price, $2.50 per volume.

This work consists of two volumes on the subject of aviation, intended to be used in teaching the fundamentals of aviation in schools. The information in the two books is supplementary, but each volume is independent of the other, and can be used separately. Volume I deals with the first principles of aviation in simple language, both for the benefit of the general reader and for those who intend to enter air transport service. The material in the book is presented as a basis for further specialized study of aviation. The second volume deals with the construction and maintenance of airplanes. It covers blueprint reading; metallurgy; oxy-acetylene welding; and airplane construction and repair. Each book contains many questions to assist the student in testing his knowledge.

RUNNING A MACHINE SHOP. By Fred H. Colvin and Frank A. Stanley. 449 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York City. Price, $3.50.

This book deals with methods employed in laying out machine shops, selecting equipment, maintaining personnel relations, and other problems confronting management in both large and small machine shops. The material is divided into eleven chapters covering the following subjects: Modern Machine Shop Practice; Planning a Shop; Shop Equipment; Shop Transport and Materials-Handling; Tool-Rooms and Tool-Cribs; Work in the Shop; Estimating; Apprenticeship and Training; Management; Foremen and Personnel Relations; and Inspection Systems.

PRACTICAL AIR-CONDITIONING. By Adolph J. Rummel and Lewis O. Vogelsang. 282 pages, 5 3/4 by 8 3/4 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $2.75.

This book contains information on air-conditioning based on the experience gained by the authors through many years of consulting and advisory work with manufacturers, dealers, service men, and operators of all types of heating, ventilating, and air-conditioning equipment. It covers essential fundamentals and definitions; all types of equipment, including automatic controls; proper methods of operating to produce desired results at a minimum of expense; and complete maintenance and servicing methods.

PREVENTION OF THE FAILURE OF METALS UNDER REPEATED STRESS. 273 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $2.75.

This handbook on the failure of metals under repeated stress has been prepared by the staff of the Battelle Memorial Institute for the Bureau of Aeronautics of the Navy Department. It outlines the fundamental causes of fatigue failures as determined by results obtained in service and in laboratory tests. Many actual examples are included. The information given should be of value to the designer, engineer, and inspector in preventing fatigue failures or in correcting possible causes.

LUBRICATION AND MAINTENANCE CHART. 25 by 38 inches. Published by the Norman W. Henley Publishing Co., 17 West 45th St., New York City. Price, 50 cents.

This is a wall chart showing sectional views of a late-model twin-bank aircraft radial engine, printed in three colors, with special reference to lubrication and fuel systems, starting and operation, running and ground tests, and regular inspection procedure. Suggestions for maintenance are also given.

* * *

One of the more popular medium-priced cars now uses bearings made of metal powders (60 per cent copper, 40 per cent nickel), which are sintered and pressed on a steel backing, and then coated with high-lead babbitt metal. This type of bearing is said to withstand high pressures very satisfactorily.